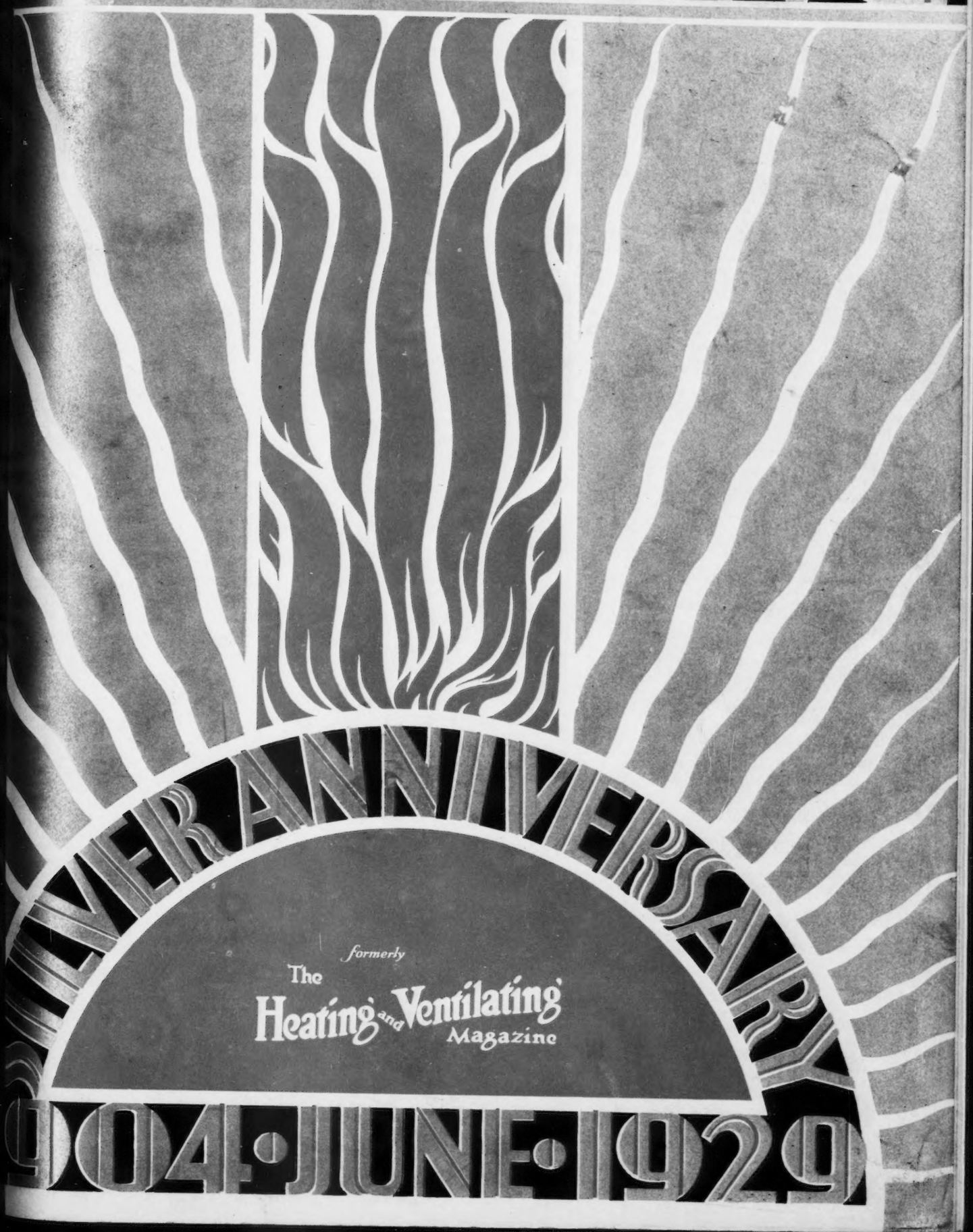
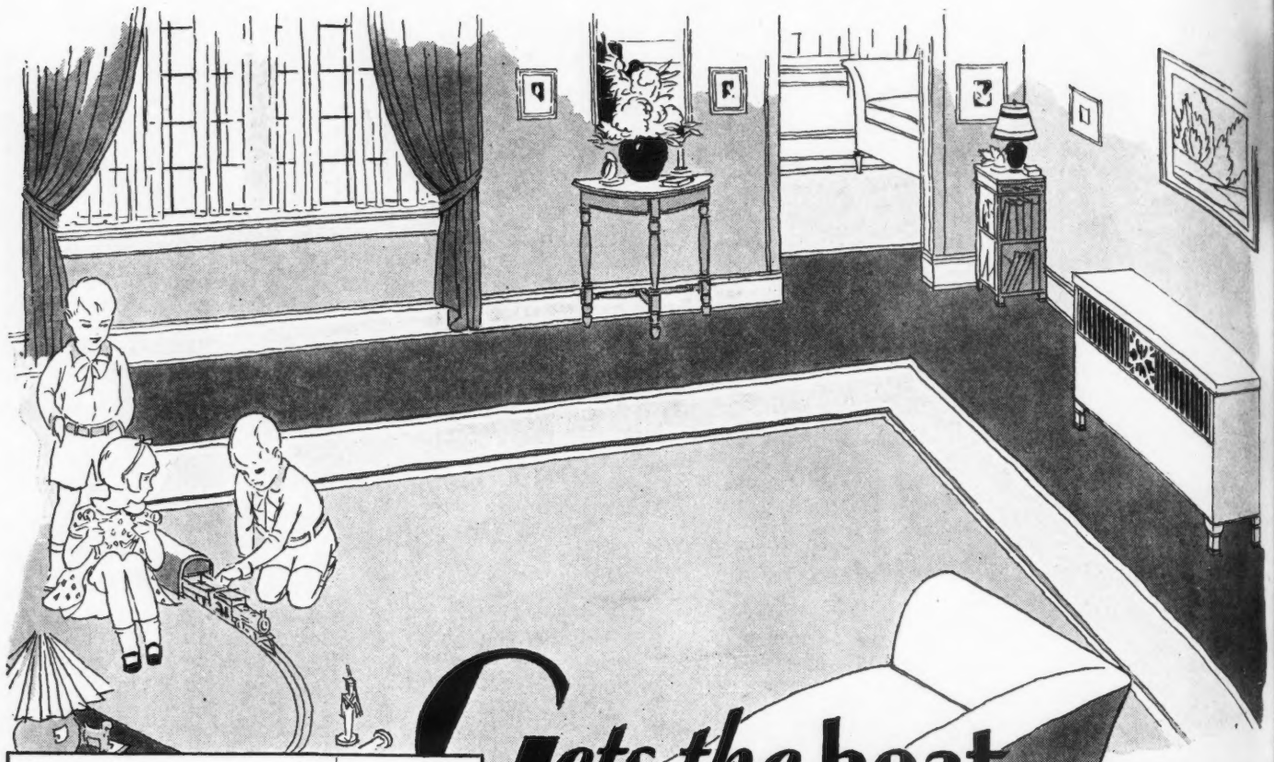
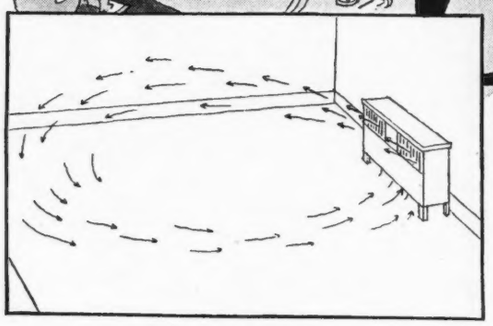
# HEATING AND VENTILATING







# Gets the heat "clear across" the room

Even a piping hot radiator can't properly heat a room unless the warmed air is circulated. With a McQuay (See diagram at left) the warmed air is driven into the farthest corners—keeping every spot in the room at practically the same temperature.

A Complete Radiator—
not just a cover

Notice that the McQuay Radiator takes air from near the floor, heats it, and then sends it out into the room, *in a horizontal direction,* with sufficient initial velocity to keep a constant flow of heated air moving into every corner.

A humidifying pan provides the moisture needed for healthy, comfortable heat.

Due to the complete circulation, and the greater heating effectiveness of moist air, comfortable warmth is maintained with lower radiator temperatures.

## McQUAY Cabinet RADIATOR

*Clean:* It sends the heat *out—not up.* So it can't "smudge" the drapes, curtains and walls.

*Attractive:* The graceful, unobtrusive cabinet of heavy furniture steel can be painted or enamelled any color desired in harmony with the decorative treatment of the room. Or, it may be finished to match the woodwork. Its beauty has an appeal that actually helps rent and sell apartments and homes.

*Indestructible:* The copper heating unit (entirely enclosed by the cabinet) is immune from rust and corrosion, will not "clog," and is as near everlasting as a radiator can be made.

*Sold only through recognized Heating Contractors*

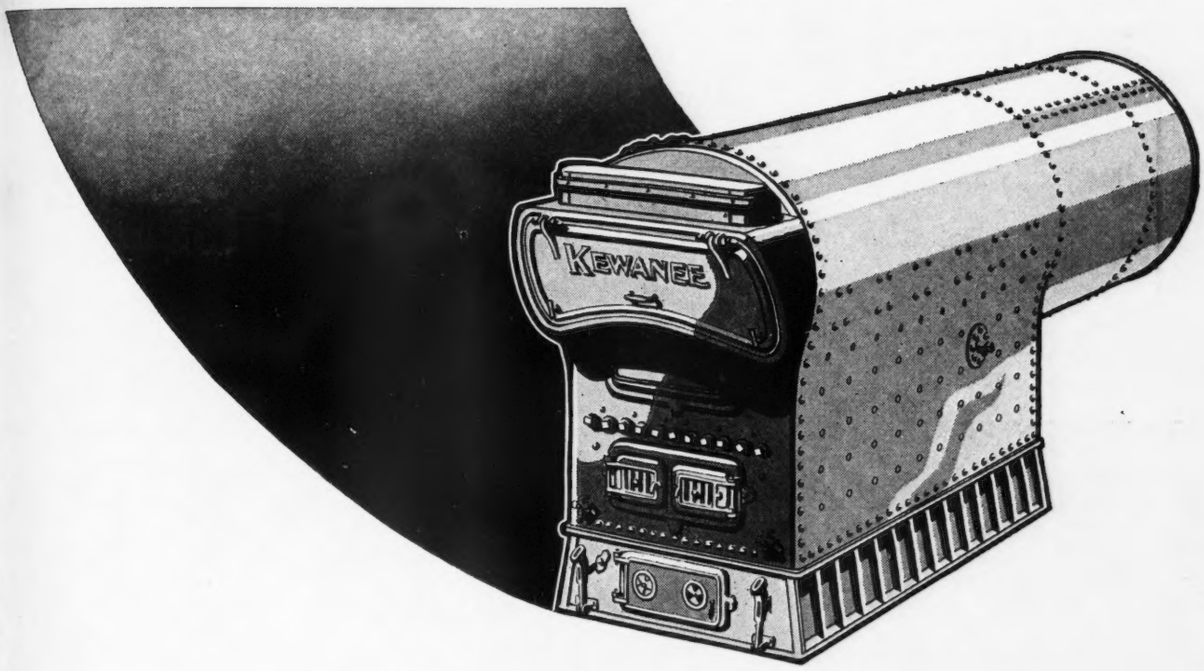
**McQUAY RADIATOR CORPORATION** General Sales Office: Pure Oil Building, Chicago

Boston: 10 High Street Cleveland: 291 E. 149th Street New York: 2148 Graybar Building

Newark, N. J.: J. F. McLaughlin Co., 738 Broad Street Pittsburgh: Bushnell Machinery Co., Century Building

# KEWANEE STEEL RIVETED BOILERS

**Spread the Original Cost** of the Heating Boiler over the 25, 30 and more years a Kewanee will be "on the job" and the purchase price becomes relatively unimportant. The first few *extra years of service* more than offset any small additional amount originally paid.




On top of that, a Kewanee will *save fuel every year of its existence.* **So that in the end it actually is the most economical boiler that can be had.**

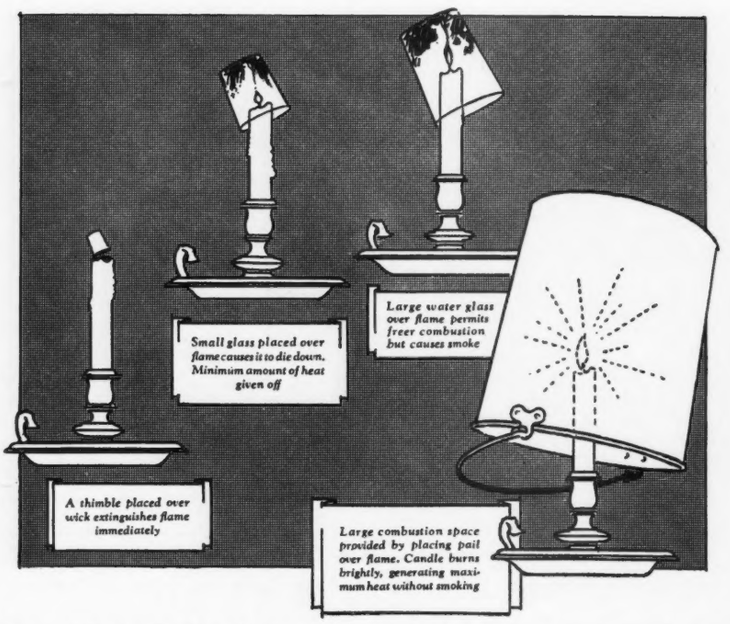
Owners know that a Kewanee in the basement adds to the value of any building. So they "Build from the Boiler — UP," invariably selecting Kewanee.

***For hard coal, soft coal, oil—no matter what the fuel—there's a Kewanee properly designed and built to burn it economically.***

KEWANEE BOILER CORPORATION Kewanee, Illinois
*Branches in 40 Principal Cities*


HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL TRADE JOURNALS, INC., at 521 Fifth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents, Vol. XXVI, No. 6, June, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

*Reduction of available air space around a candle flame withholds proper oxygen supply and causes incomplete combustion or extinguishes the flame. The Pacific's large combustion chamber insures maximum efficiency because the fuel has ample opportunity to mix with air and burn.*


Small glass placed over flame causes it to die down. Minimum amount of heat given off
Large water glass over flame permits freer combustion but causes smoke
A thimble placed over wick extinguishes flame immediately
Large combustion space provided by placing pail over flame. Candle burns brightly, generating maximum heat without smoking

# Giving combustion a chance

Any old kind of a firebox won't do! Average soft coal runs 24% to 48% volatile gas. Insufficient combustion space permits much of this gas to escape up the flues unburned . . . and there is a loss of 2% in the fuel for every 4-10 of 1% of carbon monoxide (partly burned gas) in the flue-gases.

The U. S. Bureau of Mines, after exhaustive tests, recommends a minimum of five to six cubic feet of combustion space per square feet of grate surface in order that the volatile gases may have time and space to mix with air and to burn. This is the standard on which the Pacific Steel Heating boiler is designed, its combustion space running 15% to 35% larger than that in other boilers.

Again and again the Pacific has demonstrated its fuel economy in flue-gas tests. Consistently, Pacific has proved that the maximum of available heat units in the coal is being obtained.

# PACIFIC

## STEEL HEATING BOILERS

AND CAPITOL RADIATORS MAKE A LOGICAL COMBINATION

Added to large combustion space, positive circulation, and large direct heating surface is the rugged welded construction which has made the Pacific leader in its field and dominant in the industry.

There is a Pacific installation to fit your next building. Write for literature.

PACIFIC STEEL BOILER CORPORATION

Factories: Waukegan, Ill., Bristol, Pa.

*Sales Offices in 58 Cities*

Division of United States Radiator Corporation, Detroit, Mich.

**Two S-126 ROSS STEEL Heating Boilers.**
Park Avenue Elementary School, Port Chester, N. Y.
Hauxwell and Smith, Inc., Heating Engineers.

# *Judge* boilers *by these* 10 POINTS of Superiority

1—Unrestricted circulation.

2—Smokeless.

3—Unusually large direct heating surface.

4—Full length self-cleaning convex crown sheet.

5—Tubes easily cleaned from outside.

6—One large body of water.

7—Indestructible smokeless arch with circulating baffles.

8—Large central flue.

9—All seams electrically arc welded—tubes expanded in heads.

10—Three-pass fire travel.

*Write for Catalog—Ideal for Oil or Gas Burning.*

The Frost
MANUFACTURING COMPANY
Galesburg . Illinois

*Dealers in Most Leading Cities.*

# ROSS STEEL BOILERS

*Park Shore Apartments—Chicago*
*Hardinge Installation*

# *America's Most Exclusive Apartments Equipped with Hardinge*

It is a very striking reflection of Hardinge's quality to be consistently selected for so many of America's leading structures. Precision-built in two distinct types, both Domestic and Industrial, in 9 different sizes and combinations, Hardinge makes a specific model to meet every heating need from bungalow to skyscraper. Heating and ventilating engineers are specifying an oil burner that has already proved itself marvelously efficient and economical in hundreds of America's most prominent homes and skyscrapers when they recommend the Hardinge Fuel Oil Burner.

# HARDINGE
# FUEL OIL HEAT

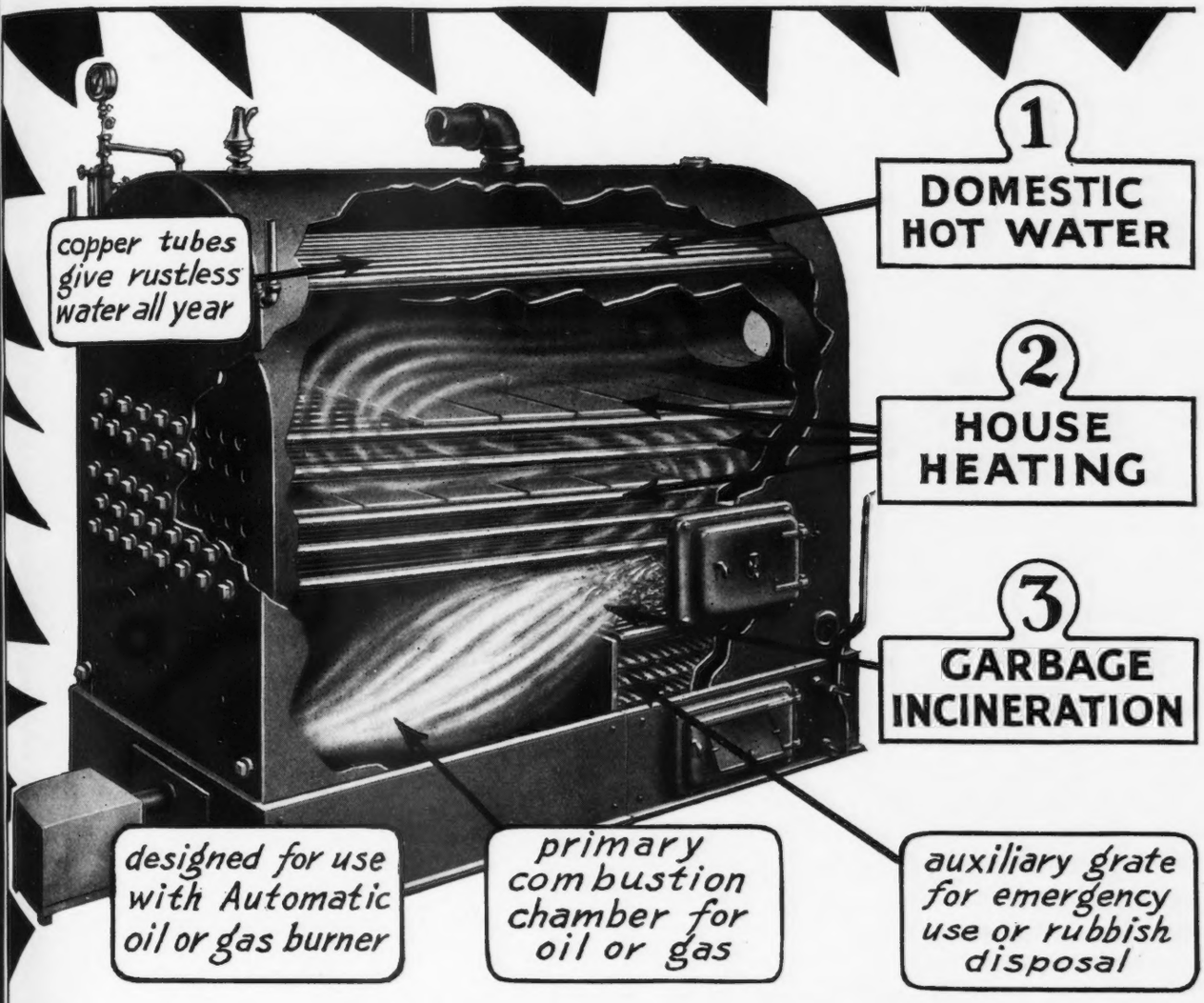
## Hardinge Brothers, Inc.

Factory and General Offices

**4149 Ravenswood Avenue, Chicago, Ill.**

*Factory Branches:* Chicago—Michigan Avenue at Ohio Street. Boston—843 Beacon Street

# TRIPLE SERVICE BOILER


1
DOMESTIC HOT WATER
copper tubes give rustless water all year
2
HOUSE HEATING
3
GARBAGE INCINERATION
designed for use with Automatic oil or gas burner
primary combustion chamber for oil or gas
auxiliary grate for emergency use or rubbish disposal

## Remarkable design gives increased heating efficiency in one compact unit

Heat—Domestic Hot Water—Incineration—all in one heating unit. Here is the fullest service in one heating unit—house heating, domestic hot water and garbage incineration. Modern to the highest degree, the Triple Service Boiler operating automatically on oil or gas gives highest efficiency. Dependability, too, is built right in, for should oil or gas service fail, emergency grate can be started with coal or wood.

These boilers are constructed throughout of heavy gauge fire box steel, with electrically welded seams, and are built in strict accordance with the A. S. M. E. Code for 15 lbs. working pressure. The initial cost of the unit is less than the combined prices of separate standard equipment accomplishing the same three operations. Domestic hot water, through copper tubes, is supplied all year, yet the yearly fuel cost will be found lower than a standard boiler alone.

Complete odorless incineration of all combustible refuse is assured because of the location of the grate in the direct path of the flame.

During summer when house heating system is shut off, the hot water service continues, controlled by an Aquastat. The boiler works only long enough to raise boiler water to a temperature that will give plenty of domestic hot water. The life of the boiler is indefinitely prolonged by not shutting it down.

Still another interpretation of triple service is—lower first cost, lower upkeep cost and greater comfort and service.

**THE INTERNATIONAL BOILER WORKS COMPANY**
**East Stroudsburg, Penn., U. S. A.**

# The Growth of an IDEA

**A Few Outstanding Users**

Rockefeller Institute
New York City

Fisher Body Corporation
Detroit, Mich.

Greeley Square Building
New York City

Woodstock Tower
New York City

Detroit Steel Products Co.
Detroit, Mich.

Michigan Boulevard Garden Apartments
Chicago, Ill.

Northern States Power Co.
Minneapolis, Minn.

Curtiss-Robertson Aeroplane Co.
St. Louis, Mo.

Greer Steel Company
Cleveland, Ohio

Masonic Temple
Harrisburg, Pa.

Hotel Taft
New Haven, Conn.

Goldman Hotel
Fort Smith, Ark.

Forsythe Building
Oak Park, Ill.

Board of Education
Rochester, N.Y.

Biltmore Hotel
Santa Barbara, Cal.

General Motors Corporation
Sao Paulo, Brazil

Imperial Japanese Railways
Tokio, Japan

***Backed by Three Year Guarantee Against Wear***

**IN 1923 an idea was born. Fostered by years of constant research and untiring effort in the perfection of its design, and in exhaustive tests, it was finally presented to the world in 1927 as the *Ames Vacuum Heating Pump.***

**Starting its production with the Staten Island Shipbuilding Company and, in 1928, affiliating with the American Locomotive Company, the AMES PUMP has, since its inception, been assured of the advanced engineering knowledge that means *Perfection in Design*—the vast manufacturing facilities and economies that mean *Intrinsic Value.***

**From the designer's drawing board... through the testing periods... the giant production plant ...and on to the installation — the AMES PUMP has been subject to the most rigid inspection — has been put to the most exacting tests — has been put to work on the most difficult jobs ...**

• • • • •

**In every case it has proven itself to be**

***The Pump of Performance***

**AMES PUMPS • PERFORMANCE**

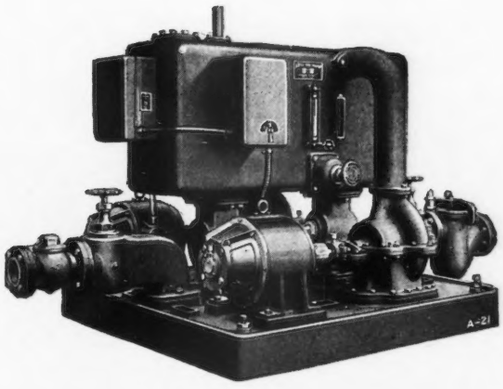
# An Acknowledgment

## . . . and a PLEDGE

To those Architects, Engineers, Contractors, and Owners, who have, by their confidence in this organization, enabled the AMES PUMP to prove its superior worth in building installations the world over, we are duly grateful.

To them, and to the industry at large, we pledge our untiring effort to work with them, whenever and wherever they command us.

. . . . ***We are particularly appreciative of the number of "repeat" orders from satisfied users. They represent the most complete justification of the fact that theAmes IS the Pump of Performance.***



**AMES PUMP COMPANY, INC**

**30 CHURCH STREET NEW YORK CITY**

*Affiliated with*

**AMERICAN LOCOMOTIVE COMPANY**

**At these Sales Offices there is Complete Information on Pump Performance for YOUR Needs**

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| Cleveland, | Ohio |
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| Cincinnati, | Ohio |
| Denver, | Colorado |
| Des Moines, | Iowa |
| Detroit, | Michigan |
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| Fort Worth, | Texas |
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| Little Rock, | Arkansas |
| Los Angeles, | California |
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| Memphis, | Tennessee |
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| Nashville, | Tennessee |
| New London, | Connecticut |
| New Orleans, | Louisiana |
| New York, | New York |
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| Oklahoma City, | Oklahoma |
| Omaha, | Nebraska |
| Philadelphia, | Pennsylvania |
| Phoenix, | Arizona |
| Pittsburgh, | Pennsylvania |
| Portland, | Oregon |
| Richmond, | Virginia |
| San Antonio, | Texas |
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| St. Paul, | Minnesota |
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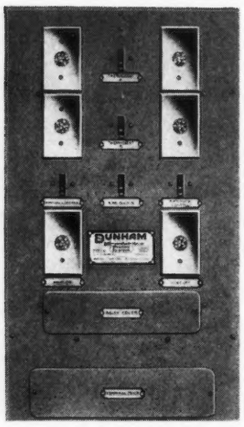
| Seattle, | Washington |
| Shreveport, | Louisiana |
| South Bend, | Indiana |
| Toledo, | Ohio |
| Toronto, | Ontario |
| Vancouver, | British Columbia |
| London, | England |
| Tokio, | Japan |

**• DISTINCTIVELY DIFFERENT •**

# The part that Dunham played



*Dunham Zone Temperature Control Panel, as installed in Carbide and Carbon Bldg., Chicago, the Dunham Bldg., and other well-known structures.*

The part that C. A. Dunham Co. played in the development of modern heating has been no small one.

Prior to the invention of the Dunham Thermostatic Radiator Trap in 1903 various systems of low pressure steam heating had been in use for many years. Of these the vacuum return line system alone offered promise of possibilities for a solution of the heating problem as it then existed.

However, the future success of the vacuum return line system was beset with stumbling blocks in the shape of inefficient radiator traps which, up to the invention of the Dunham Thermostatic Radiator Trap, were all that heating practice offered to remove air and water from radiators and piping and to eliminate faulty and noisy circulation of steam.

The invention of the Dunham Trap, with its automatic thermostatic control of air and non-condensable gases that are met with in steam radiators, solved the problem and converted steam heating to the completely satisfactory service that it now is, and contributed to the possibility of the present-day skyscraper. The Dunham Trap was the original fluid-operated thermostatic Radiator Trap. This Dunham principle has been followed in all similarly operated traps offered by other manufacturers since 1903 when the Dunham Trap was placed on the market.

Today a new and even more revolutionary Dunham invention, the Dunham Differential Vacuum Heating System, has opened up well nigh limitless possibilities for steam heating economy and efficiency through its use (in conjunction with the Dunham Trap) of Sub-Atmospheric Steam.

It has been through such outstanding contributions as these to the furtherance of the art of heating that this company has grown from its humble beginning in 1903 in a small building in Marshalltown, Iowa, to an international and nation-wide organization, with factories at Marshalltown, Michigan City and Toronto, with its own nine-story office building in Chicago, and with outstanding installations in the United States, Canada, the United Kingdom and the Far East that make Dunham everywhere recognized as a dominant factor in the heating industry.

## C. A. DUNHAM CO.

***DUNHAM BUILDING***

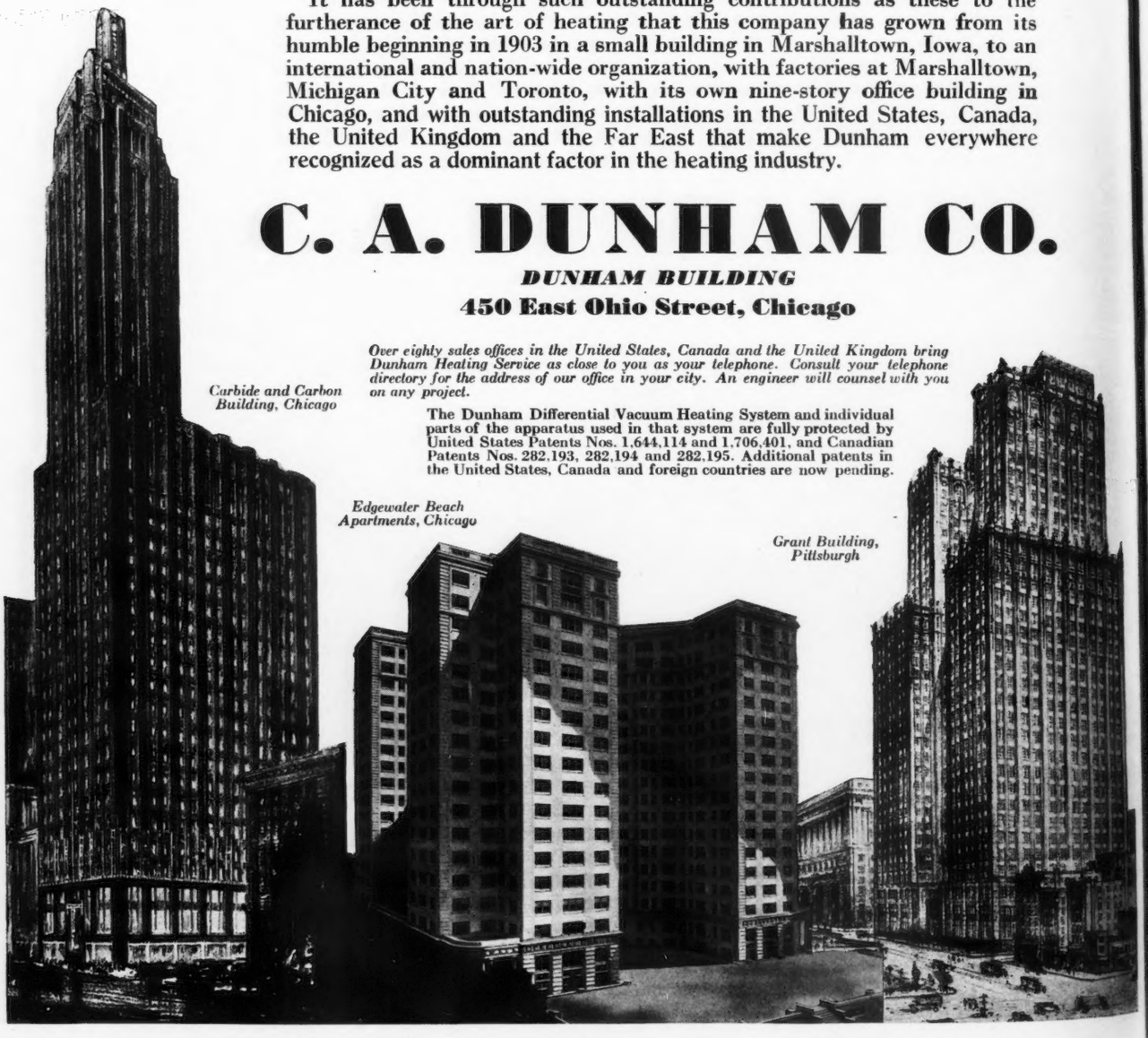
**450 East Ohio Street, Chicago**

*Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.*

*Carbide and Carbon Building, Chicago*

*Edgewater Beach Apartments, Chicago*

*Grant Building, Pittsburgh*



The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

# *in developing modern heating*

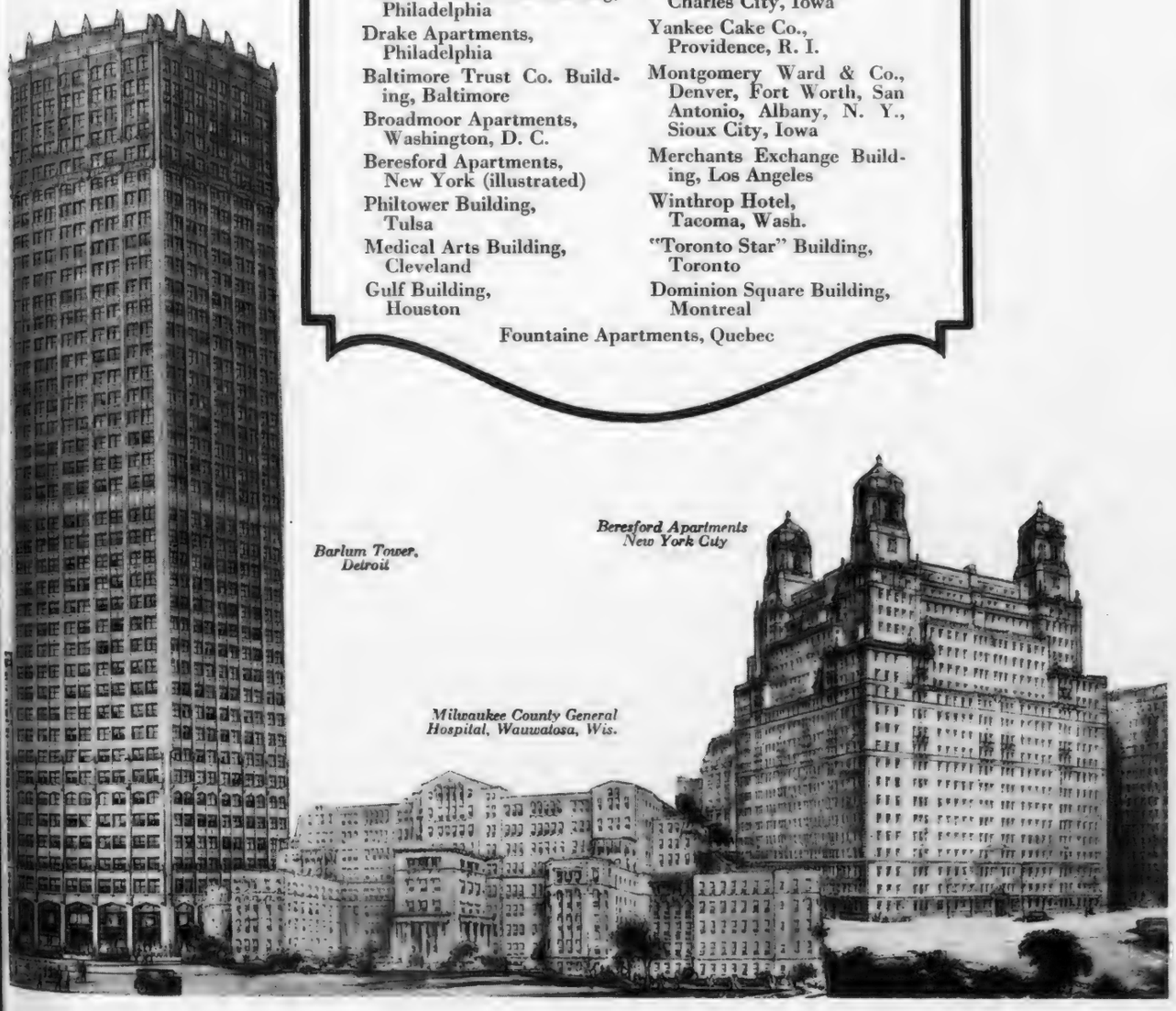
Below are listed a few of the many buildings in which the Dunham Differential Vacuum Heating System is installed or is being installed. The nature and character of these structures is such as to indicate the widespread acceptance by the nation's leading architects, engineers and heating contractors of this outstanding new Dunham invention.

## *The* Dunham Differential Vacuum Heating System

***Look for the name***
**DUNHAM**

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

Carbide & Carbon Building, Chicago (illustrated)
Marshall Field Garden Apartments, Chicago
Edgewater Beach Apartments, Chicago (illustrated)
Danly Machine Specialties, Inc., Chicago
Barlum Tower, Detroit (illustrated)
Water Board Building, Detroit
Grant Building, Pittsburgh (illustrated)
First National Bank Building, Philadelphia
Drake Apartments, Philadelphia
Baltimore Trust Co. Building, Baltimore
Broadmoor Apartments, Washington, D. C.
Beresford Apartments, New York (illustrated)
Philtower Building, Tulsa
Medical Arts Building, Cleveland
Gulf Building, Houston
Milwaukee County General Hospital, Wauwatosa, Wis. (illustrated)
Smith-Young Tower Building, San Antonio
The Temple Building, Rochester, N. Y.
Battle Creek Sanitarium. Battle Creek
College of St. Teresa, Winona, Minn.
Stuart Building, Lincoln, Neb.
Hart-Parr Co., Charles City, Iowa
Yankee Cake Co., Providence, R. I.
Montgomery Ward & Co., Denver, Fort Worth, San Antonio, Albany, N. Y., Sioux City, Iowa
Merchants Exchange Building, Los Angeles
Winthrop Hotel, Tacoma, Wash.
"Toronto Star" Building, Toronto
Dominion Square Building, Montreal
Fountaine Apartments, Quebec



*Barlum Tower, Detroit*

*Beresford Apartments New York City*

*Milwaukee County General Hospital, Wauwatosa, Wis.*

# That YOUR BUSINESS *may enjoy* NEW *and* GREATER PROSPERITY · *an unsurpassed* LINE · *a virile* SELLING PLAN

**Aero Radiation**

Aero Radiators pioneered the way to new heating efficiency, were the first to supply beauty for every setting and utility for every heating purpose.

**National Super-Smokeless Boiler**

Specifically designed for the efficient and smokeless combustion of all grades of fuel. Distinguished for its swirling scarlet flame, and balanced secondary air supply.

**National Jacketed Boiler No. 4 Series**

Brings a new conception of what a boiler can offer in outstanding attractiveness, fuel-saving efficiency, and upstanding service; a striking and colorful jacket, and contrasting trim.

**National Jacketed Gas Boiler No. 1**

Cleanliness, convenience, accurate maintenance of any desired degree of warmth—are the contributions of this strikingly attractive, highly efficient boiler.

**National Novus Boilers**

These businesslike, dependable, effective boilers have for 18 years been demonstrating their worth in all types of applications, all over the country.

**National Round Boiler**

In residential and small building heating, its staggered fire travel leads straight to efficiency, economy, and complete and permanent user satisfaction.

**National Contento Boiler**

Furnishes the old house, the small house, or the house without a basement with radiator heat, at almost the price of coal stoves.

**National Gothic Hot Water Supply Boiler**

Provides a constant, unfailing supply of hot water for home and small apartment use, at an extremely low fuel cost.

**National Low Water Line Boiler**

Where lack of head room is the problem, this boiler is always the best, often the only, solution; highly efficient.

# NATIONAL

*Made-to-Measure*

# HEATING SYSTEMS

# *Made-to-Measure* • *the* NEW VOGUE *in* HEATING *backed by* NATIONAL'S *big* SALES PROMOTION PLAN

1. National Bonded Boilers—
   A Surety Performance Bond with every National Boiler.

2. National Protective Payment Plan
   Exclusive and revolutionary—a partial payment plan backed by a joint life, permanent disability and fire insurance policy.

3. National Heating Guide—
   Blue Book of the Industry—chock full of pertinent facts, tables and informative data—a real handbook for the industry.

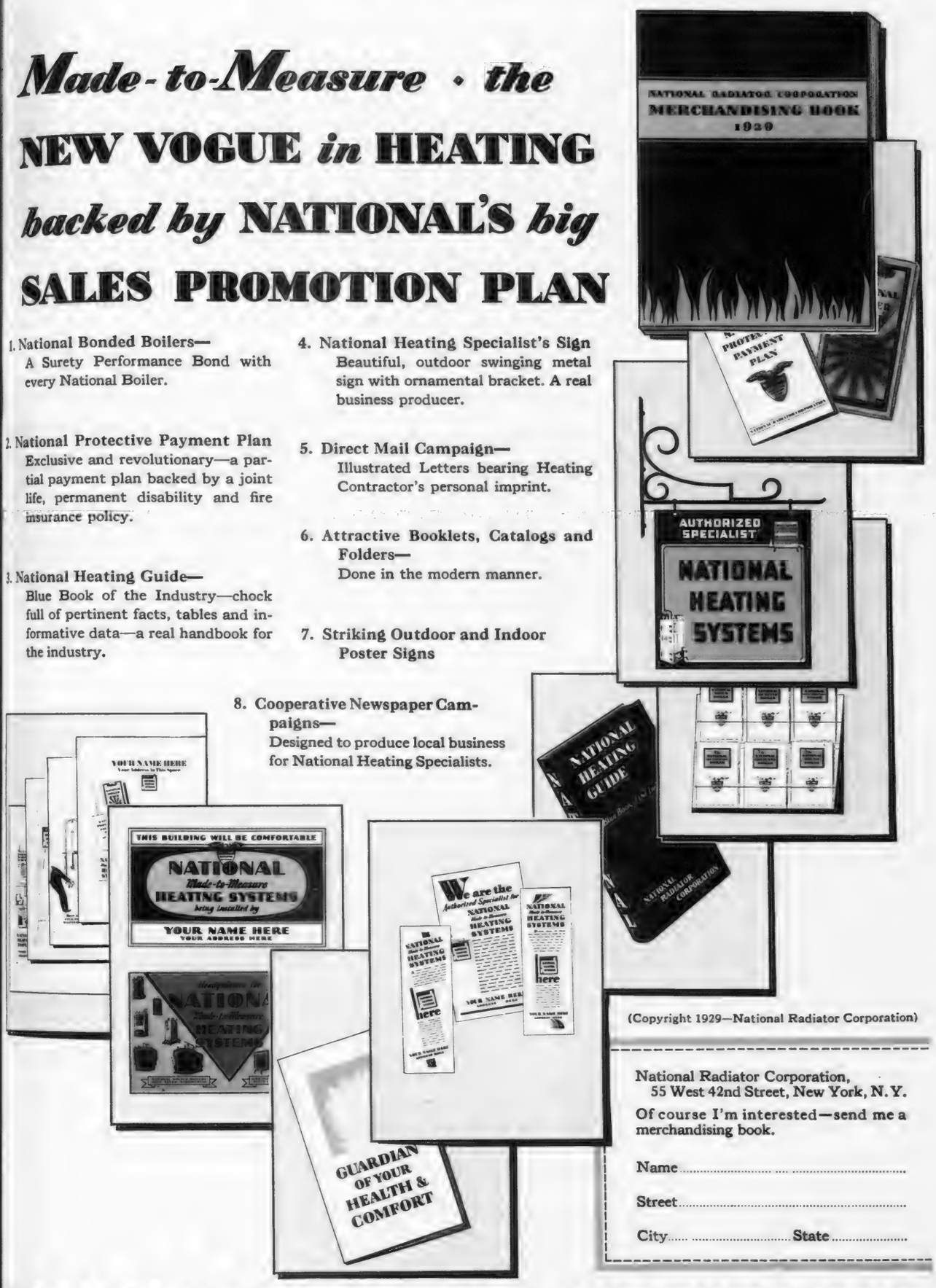
4. National Heating Specialist's Sign
   Beautiful, outdoor swinging metal sign with ornamental bracket. A real business producer.

5. Direct Mail Campaign—
   Illustrated Letters bearing Heating Contractor's personal imprint.

6. Attractive Booklets, Catalogs and Folders—
   Done in the modern manner.

7. Striking Outdoor and Indoor Poster Signs

8. Cooperative Newspaper Campaigns—
   Designed to produce local business for National Heating Specialists.

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National Radiator Corporation,
55 West 42nd Street, New York, N. Y.

Of course I'm interested—send me a merchandising book.

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Street .....

City ..... State .....

## NATIONAL RADIATOR CORPORATION

***Executive Offices:*** **55 West 42nd Street, NEW YORK, N. Y.**

VAPOR–VACUUM–PRESSURE HEATING SPECIALTIES

# *For many years*

## O-E "3-in-1" Heating Systems

specified for exacting architects by capable engineers—installed by substantial heating contractors for owners and builders—O-E "3-in-1" systems have always given the ultimate in heating comfort—and in economy of installation and operation.

From coast to coast — everywhere — in buildings of all kinds—small and large—O-E "3-in-1" systems—simple, efficient—proven—by time and service—could be nothing less—for O-E products are the result of 35 years' experience—and all are guaranteed.

## AND NOW

VAPOR-VACUUM PRESSURE HEATING SPECIALTIES
THERMOSTATIC, DIFFERENTIAL
DRIP AND BLAST TRAPS
FLOAT VENT AND CHECK VALVES—DAMPER REGULATORS
—GAUGES—FUEL SAVERS, Etc.

# *The Latest Practice in*

# HOT WATER HEATING

## The O-E Flow-Control Fitting

Controls circulation in both gravity or forced-feed heating systems ..... Adjusted while the system is in operation ..... Remove name plate cap and adjust flow with screw driver ..... AND no one can tamper with the plug setting!

## FOR NEW or OLD HEATING SYSTEMS

From the smallest bungalow job to the largest building or industrial plant.

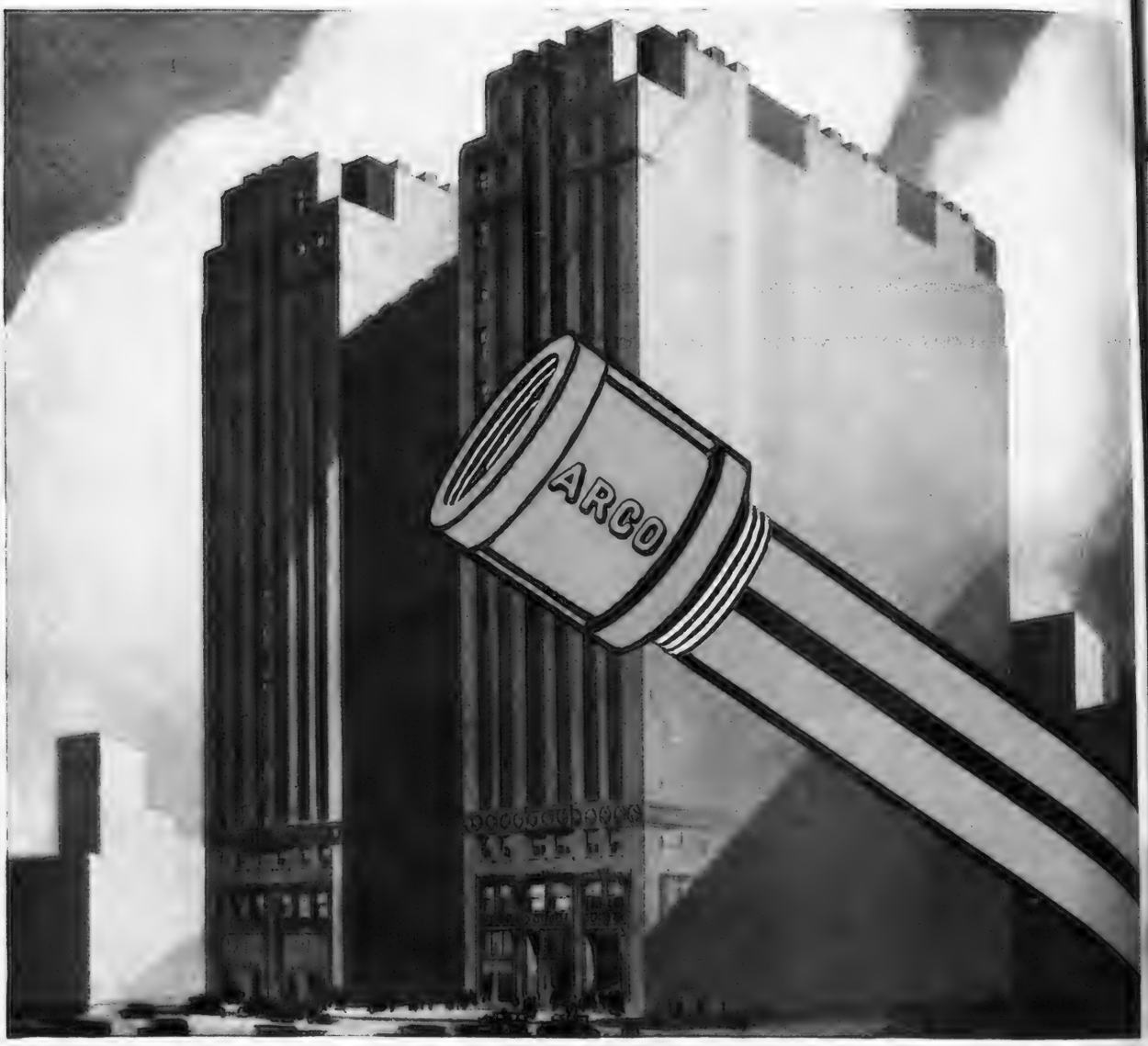
Truly, the latest development—making new jobs the best .... and old jobs, good or bad, better! ..... Specify ... and buy ...

## THE O-E HOT WATER FLOW-CONTROL FITTING

O-E SPECIALTY MANUFACTURING CORP.

MILWAUKEE, WISCONSIN, U. S. A.

ANOTHER TRADE OE MARK ACHIEVEMENT




*Architects*: GRAHAM, ANDERSON, PROBST and WHITE, Chicago *Plumbing and Heating Contractor*: A. R. BRUEGGEMAN CO., Cleveland, Ohio

## MEDICAL ARTS BUILDING
### Cleveland, Ohio

"Our experience with the installation of Arco Metal Pipe in the Medical Arts Building has been satisfactory in every way. We used about eight carloads of your pipe for soil, waste and vent lines including branches of the plumbing system. This pipe was all assembled with screw thread joints. Our men cut and threaded the pipe on the job with the same tools used regularly for wrought steel and iron pipe."

(*Signed*) A. R. BRUEGGEMAN, President
A. R. BRUEGGEMAN CO.

Arco Metal Pipe has already proven its superiority and practicability for the following services: Plumbing, soil, waste and vent lines—heating condensation lines, all buried lines, submerged lines in salt water, industrial water supplies, water and gas service lines, industrial waste lines, chemical process manufacturing lines, sprinkler systems and many other installations where corrosion and erosion are factors. Arco Metal Pipe, Couplings and Nipples can be readily distinguished by their distinctive coating of red non-bleeding paint and the black strip on one side with the name "ARCO" stenciled at intervals on the other. This distinctive marking will protect customers against substitutes.

# AMERICAN RADIATOR

40 West 40th Street, New York

# ARCO METAL PIPE

## *A Remarkable Alloy Cast Iron Pipe That Can Be Cut and Threaded with Standard Pipe Tools*

ARCO Metal Pipe presents a combination of qualities never before found in any pipe. Its flexibility, tensile strength, corrosion and erosion resisting qualities exceed those of ordinary gray cast iron and in addition it can be cut and threaded at any point within its own length with the same tools used on wrought steel and iron pipe.

This new pipe is not in the experimental stage. For the past two and one-half years it has been used in a wide variety of installations—frequently replacing more expensive materials.

Arco Metal Pipe is made of a superior close-grained nichrome alloy iron and cast by a special process—Each length is tested by hydrostatic pressure—tests ranging from 300 to 1,000 pounds per square inch—It is true to dimensions, smooth outside and inside—uniform wall thickness—All standard flow tables for extra strength wrought steel and iron pipe can be used to figure the capacity of Arco Metal Pipe—Can be welded in any lengths at plant or on the job—tests and thousands of welded feet now in operation prove that the weld is as strong as the pipe—Standard type of screwed fittings can be used with Arco Metal Pipe.

Arco Metal Pipe is made in the following sizes: 1½″, 2″, 2½″, 3″, 4″, 5″, and 6″ (8″, 10″ and 12″ available later) and is sold by all leading distributors of plumbing, heating and mill supplies.

**SEND FOR CATALOG**

Send us your name and address and we will mail you the Arco metal pipe catalog giving complete information.

**COMPANY**

**BRANCHES in all PRINCIPAL CITIES**

## *In the Years to Come*

SKYLINES are constantly changing . . . today's landmarks give way to tomorrow's creations. Architects and engineers while striving and planning for greater triumphs are specifying newer, better materials . . . quality is improved—service is broadened—beauty is enhanced. The ultimate goal is yet unknown. But this much is certain: the name of the pipe that will appear on specifications in the years to come will be that pipe that has constantly improved and kept pace with building progress.

The Scale Free Process, applied to butt-weld sizes ½ to 3-inch, is an example of improving pipe service . . . it represents the most advanced thought in pipe manufacture... it contributes most to economy by minimizing corrosion. This means longer life and better service. This process was invented and developed by National Tube Company and has contributed in making "NATIONAL"—

*America's Standard Wrought Pipe*

NATIONAL TUBE COMPANY

***Frick Building, Pittsburgh, Pa.***

*Subsidiary of* United States Steel Corporation

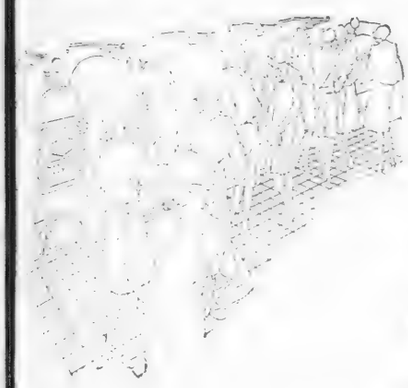
# NATIONAL PIPE

# HEGGIE-SIMPLEX PRESENTS the FIRST *JACKETED* STEEL BOILER

NOT just another jacketed boiler! This new Heggie-Simplex unit is, first of all, of crackproof *steel* construction; designed to produce heat at an unprecedented low cost.

The sparkling beauty of its jacket is made permanent by tough lacquer finish. Thick blankets of *rock wool* insulate all sides. Its smart coloring—French grey with black trim—is what women want. They like its dignified, unobtrusive beauty, and practical value in not showing dust. At a recent exhibit, attended by thousands, this boiler was displayed in a variety of colors, including those usually used on jacketed boilers. When asked their preference, 92% chose this French grey and black.

*92% Chose this Grey*

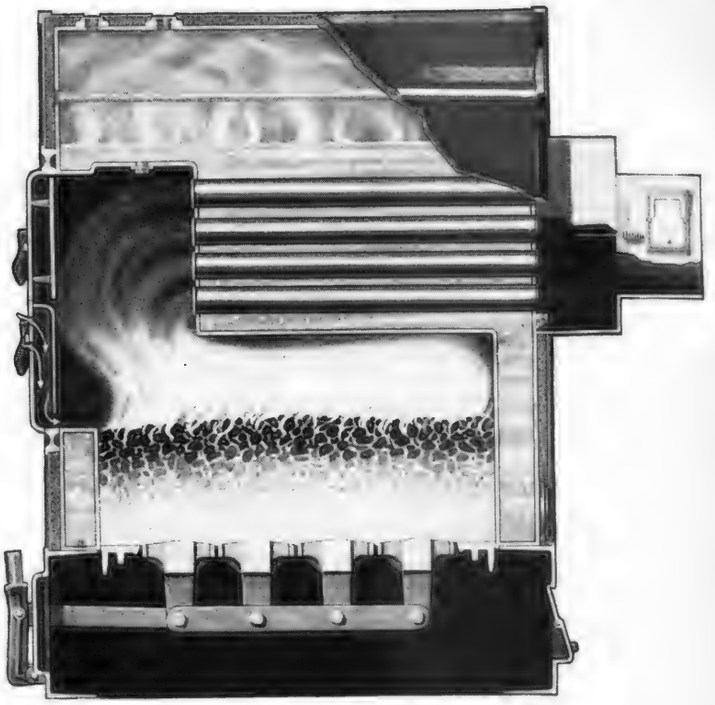


## Adding the Beauty of Modern Coloring to the Permanence of Steel

# A New Standard in Residence Boilers

**Rock Wool Blankets Insulate ALL Sides**

Ready-cut blankets of Rock Wool that only have to be laid in place, are supplied for *all* sides of this Heggie-Simplex Boiler. This material the Bureau of Standards has shown is twice as valuable as that ordinarily furnished with jackets.

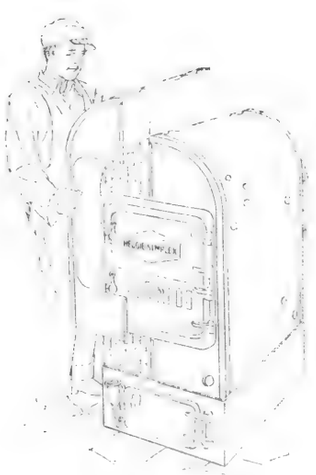


## Heat without waste

THE permanence of crackproof construction and high efficiency that have made steel boilers the accepted standard in large buildings, plus modern artistic beauty, now are available for houses and small buildings in the new Heggie-Simplex *Jacketed* Steel Boiler.

This new model not only adds color to the basement, but it operates at a fraction of the cost of ordinary residence boilers. Its spacious combustion chamber, large amount of direct heating surface, tubular flues and unrestricted circulation of water provide the essentials necessary to burn *all* of the fuel and utilize its heat without waste. The blanket of *rock wool* insulation that lines the jacket adds further to the boiler's economy.

Its large fuel capacity minimizes care. Its unit construction minimizes installation cost. It is adaptable to any fuel—coal, gas, oil. Full details on request.



**Just Two Pieces Form This Jacket**

It is so easy and simple to assemble this Heggie-Simplex jacket that the time required is negligible. Two halves form the entire jacket, clamping together without screws or bolts.

*Heggie-Simplex Boiler Company, Joliet, Illinois. Representatives in principal cities—telephone and address listed under "Heggie-Simplex Boilers."*

# HEGGIE-SIMPLEX

**STEEL HEATING BOILERS**

# 61 Years of Progress in Steel Boiler Building

In the year 1868 a sturdy Business Pioneer started to build steel Heating Appliances... Not amidst the smoke of the steel mills:... Not close to the flowing rivers that lead down to the sea:... Not in a thickly populated area...

But out in the midst of the great Illinois Prairies ... in a small town, where but a few years before the Indians had pitched their tepees ... in KEWANEE.

And from this inconsequential start has grown the greatest steel heating boiler manufacturing institution in the entire Universe. For, as the heating industry has grown from its "swaddling clothes," Kewanee has kept the pace. Often it has *made the pace.*

*Where once the Indians pitched their tepees now stands the World's Greatest Steel Heating Boiler Plant*

**PROGRESS:** Here's progress that's truly romantic. The struggling prairie town of a few years ago has become the "center of the universe" for the making of steel heating boilers.

And today steel from all the great steel mills, tubes and rivets from far away manufacturing plants are shipped by trainloads into Kewanee—fabricated into steel boilers—*and shipped back again,* often to the very points from which the raw materials originally came.

On the Atlantic Seaboard—on the sun-kissed slopes of the Pacific—in Canada, Alaska and Texas—all over the country one will find Kewanee Steel Boilers providing cheerful heat.

*The following pages briefly trace the History of Kewanee during 61 Years*

# KEWANEE

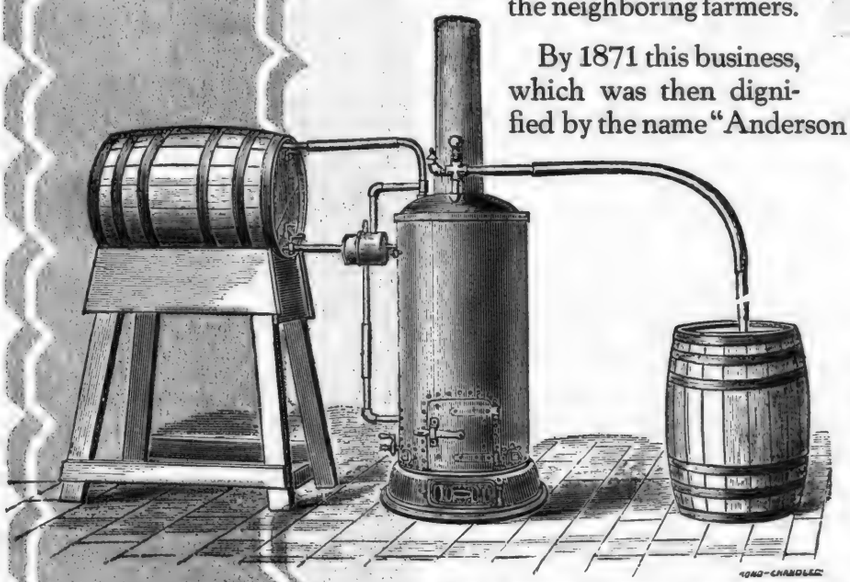
# 61 Years of Progress in Steel Boiler Building

## 1868-1880

The History of Kewanee Boilers properly goes back to the year 1868. For in that year a man named Anderson came to Kewanee and started to build the Anderson Steam Feed Cooker, for the use of the neighboring farmers.

*The Start in Kewanee—the Factory of 1868*

By 1871 this business, which was then dignified by the name "Anderson Steamer and Heater Company," had grown so that it was characterized by the "Kewanee Independent" as the *largest factory in Henry County.*



*The Anderson Universal Steamer of 1868 —the start of the present day complete Kewanee Line*

About this time Mr. W. E. Haxtun arrived in Kewanee from the New England States, and became associated with Mr. Anderson in his manufacturing enterprise, and the products of the Company were then broadened to include the Haxtun Magazine Feed Steel Heating Boiler—designed and patented by Mr. Haxtun.

By 1880 a machine shop and iron foundry had been added—and so the original company, which was to later blossom into the great Kewanee Boiler Corporation, was well under way.

---

In 1876 the Haxtun Steam Heater Company reported to State Authorities that it had a Capital of $50,000 and used annually 40 tons of boiler plate, and employed from 25 to 35 hands.

---

*By 1880 a machine shop and iron foundry had been added to the first Factory*

# 1880-1890

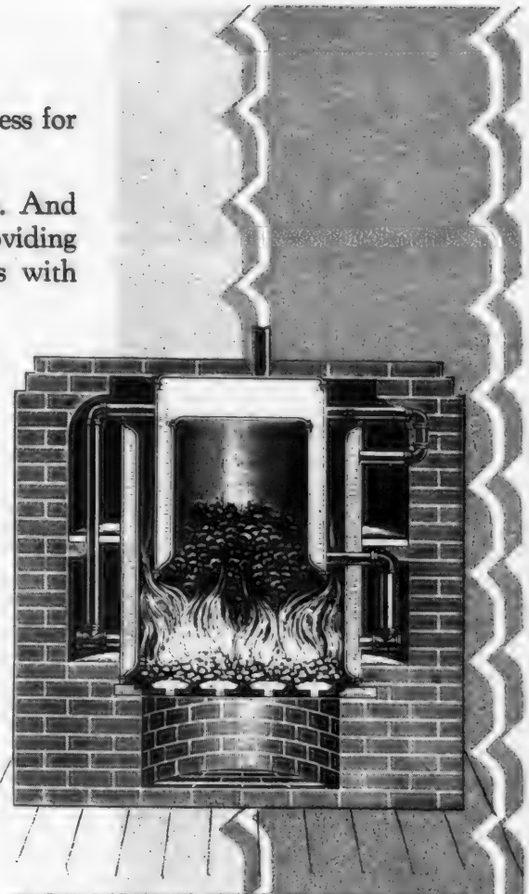
The period from 1880 to 1890 was one of remarkable progress for this fast growing concern.

The Haxtun Steel Heating Boiler enjoyed unusual success. And even today—*after fifty years*—the many Haxtuns still providing heat for some of our fine old homes testify to the fineness with which they were built.

During the latter part of 1883 the business of the Company, which was still known as the Haxtun Steam Heater Company, had increased to such an extent that it was found expedient for the Company to roll its own pipe, which it did in the Kewanee Rolling and Pipe Mills Company—the two companies being merged a year later, as the Haxtun Steam Heater Company.

By 1888 a radiator shop had been added—manufacturing radiators as was the practice in those days, from pipe.

The interesting picture reproduced from an artist's drawing made of the plant in 1888 bears the inscription: Haxtun Steam Heater Company — manufacturers of wrought iron pipe, boilers, radiators, steam heating apparatus and supplies.



"HAXTUN" BASE-BURNING BOILERS, FOR HARD OR SOFT COAL

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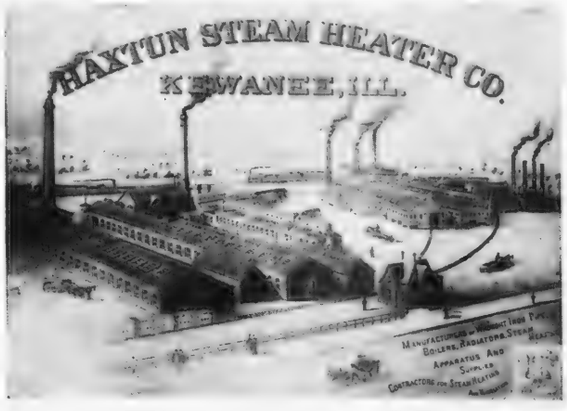
Through the medium of modern, continuous advertising, the story of Strength, Dependability and Economy—the foundation of Kewanee Boilers—has been so completely spread among owners that invariably *they are preferred.*




# KEWANEE

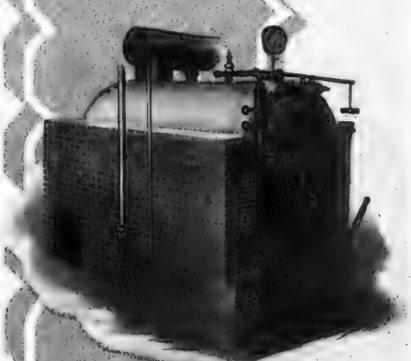
# 61 Years of Progress in Steel Boiler Building

## 1890
## 1900

*The Plant and The Men in 1892*

In March 1891 the name of the Company was changed to the Western Tube Company, and in the spring of 1892 the Company was divided into two entirely separate organizations—one continuing business as the Western Tube Co. (later becoming a part of The National Tube Co., a subsidiary of The United States Steel Corporation) and manufacturing pipe, fittings, etc., the Kewanee Boiler Company being organized to continue the manufacture of steel boilers.

During the first few months of operation the Kewanee Boiler Company used the old shop in which boilers had so long been manufactured. But very shortly an addition was built so that the plant then "spread over" one and a half acres of ground and gave employment to some one hundred men.



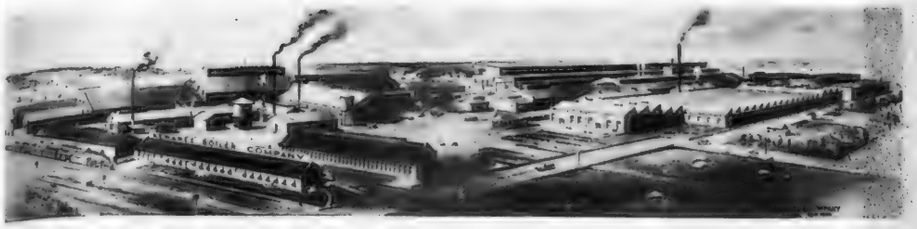
*The first Kewanee Firebox Boiler—the brickset type*

One of the first developments of the Kewanee Boiler Company was the Kewanee Brickset Firebox Boiler for heating—a boiler which is today, with the necessary modifications to bring it up to date, a great favorite with many architects, engineers and contractors.

The next forward step was the purchase of some seven acres of ground, in a different part of Kewanee and the erection of a new plant.

And then the Company was embarked on a voyage of Progress and Expansion—destined to make it The Leader, and spread its products out to every corner of our Country and to Countries across the seas.

*Budding into a full grown plant, covering a wide expanse of ground. The plant in 1900*



# 1900-1920

During 1902 a cast-iron radiator foundry added to the size of the ever growing plant

During 1906 many of the chief cities in the United States, particularly those in or near the soft coal markets, began a serious study of smoke—this subject having become one of grave importance in its effect upon the public's health, comfort and purse.

Kewanee had foreseen the trend and introduced the Kewanee Smokeless Boiler as the proper means of burning soft coal smokelessly and economically.

More than 20 years of use have demonstrated that the Kewanee principle, of down-draft construction, is the correct one for burning any coal completely—*for smoke is nothing but unconsumed fuel.*

A further development, during this same period, was the Kewanee *Portable-Type* Firebox Boiler—shown at the right—a type of boiler which is fast increasing in popularity in many localities.

*The Kewanee Portable*

By 1920 increased facilities were again needed — and a "Million Dollar" addition to the boiler plant was built—bringing the total of acres occupied up to thirty-three.

# KEWANEE

# And Now—After 61 Years of Progress—

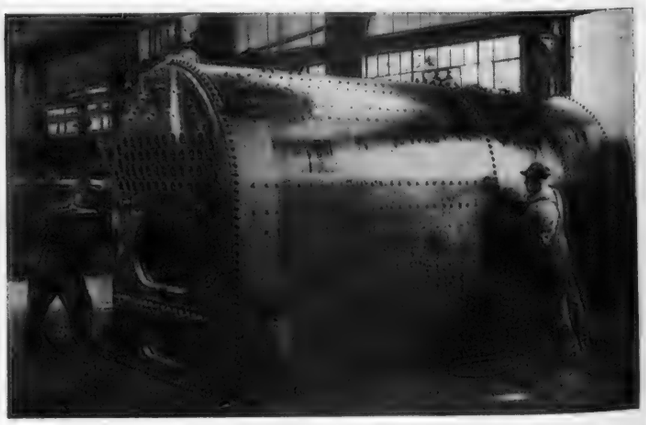
**Truly a Titan Plant**—actually the largest steel heating boiler plant in the world—covering in all some 33 acres and giving profitable employment to thousands, to whom are paid each year million of dollars.

1876

## A Contrast in Manufacturing Methods:

**1876:** Alternate smashing hammer blows on each red-hot rivet by a team of husky boiler makers. Thus it was that by main strength and good eyesight Kewanee Boilers were "hand tailored" in those days.

**1929:** Giant cranes easily swing 20-ton boiler sections up to the riveting tower where the hot rivets are squeezed into place by the 250 tons pressure from the hydraulic riveters. Less get-at-able rivets are hammered home by staccato blows of pneumatic riveters.



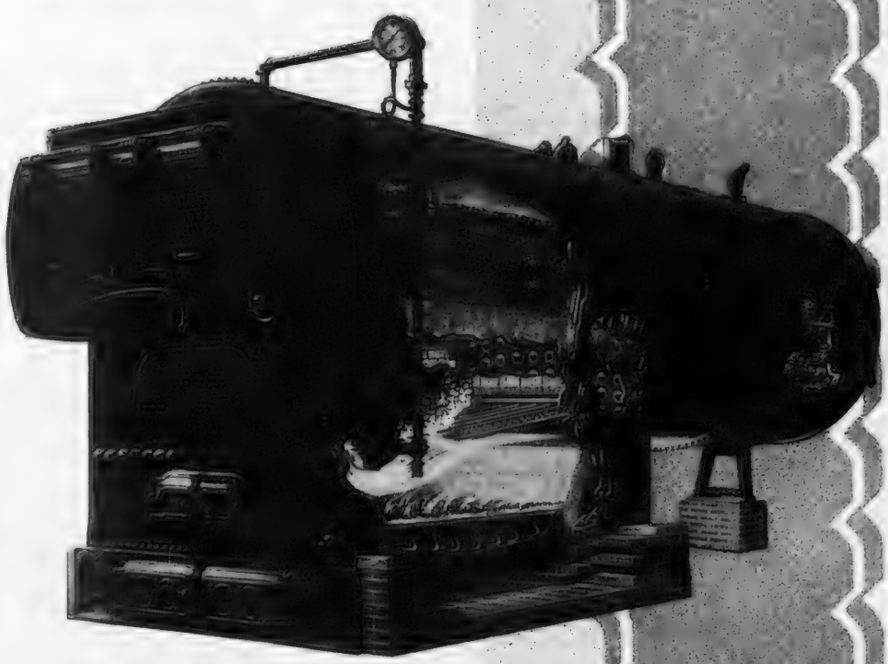
1929

# And NOW Within the Boiler Shop

These brawny men, aided by millions of dollars worth of the finest and latest equipment, annually take tens of thousands of tons of steel boiler plate, fashion it into boilers for heating; then load them onto cars for shipment to the most remote parts of the country.

A trainload of boilers is manufactured in a single day, and in the extensive shops and yards thousands of boilers are under way and in stock to fill the call for dependable Kewanee heat.

**And So:** The infant of 1868—ever progressing—has grown to manhood. And the small prairie town has become the "center of the universe" in the making of steel heating boilers.



Here, surely, is romance. More than that—*it is unassailable testimony of progress, worth and integrity.*

For these things have made the word Kewanee recognized as the name of the Leader among all Steel Heating Boilers.

# KEWANEE

# KEWANEE

## BOILER CORPORATION

MAIN OFFICE AND FACTORY
KEWANEE, ILLINOIS

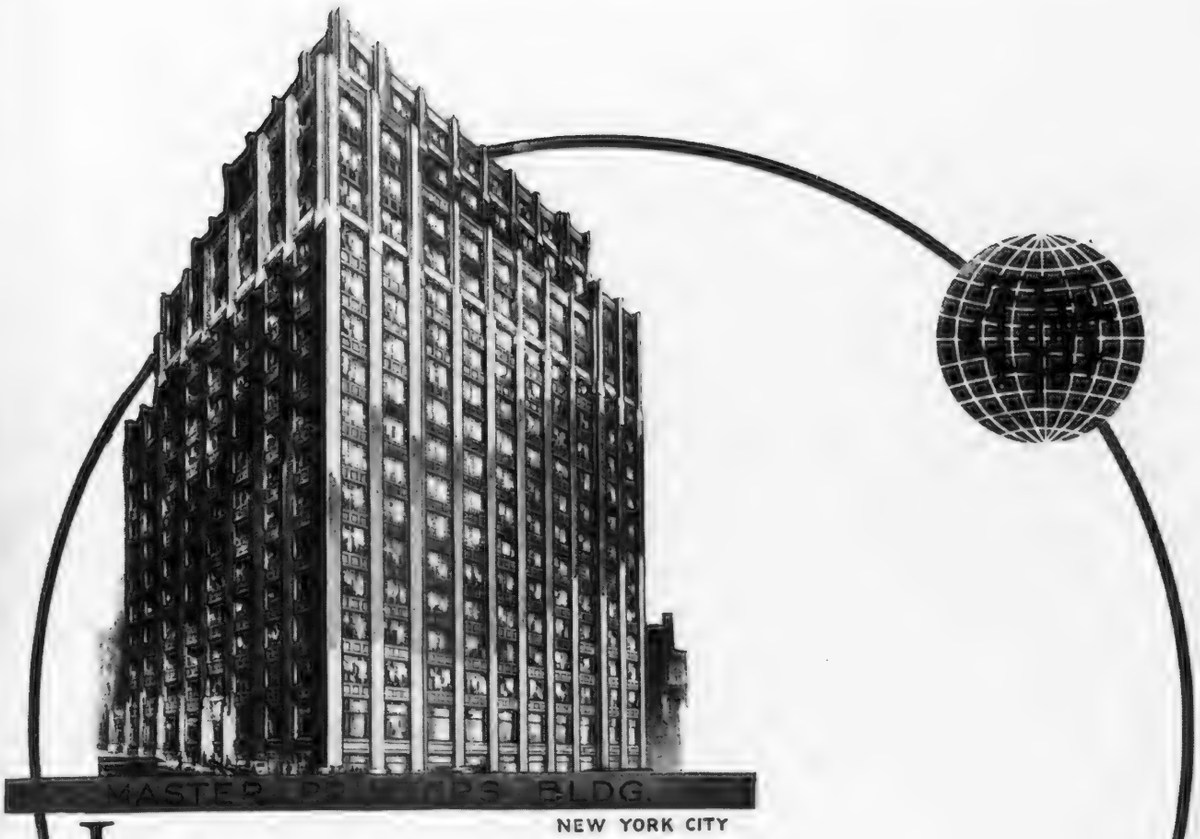
*BRANCHES*

ATLANTA 955 Marietta St. N.W.
BIRMINGHAM 841 Martin Bldg.
BOSTON 1140 Little Bldg., 90 Boylston St.
CHATTANOOGA 1104 James Bldg.
CHICAGO 1858 S. Western Ave.
CINCINNATI P. O. Box 75
CLEVELAND 2341 Carnegie Ave.
COLUMBUS 243 N. High St.
DALLAS Suite 408-9, Dallas Nat'l Bank Bldg.
DENVER 1226-1228 California St.
DES MOINES 707 Hubbell Bldg.
DETROIT 2051 W. Lafayette Boul.
EL PASO 401 N. Santa Fe St.
GRAND RAPIDS 402½ Michigan Trust Bldg.
GREENSBORO, N. C. 703 Jefferson Bldg., Box 536
INDIANAPOLIS 221 Indiana Terminal Warehouse
KANSAS CITY 2014 Wyandotte St.
LOS ANGELES 306 Crocker St.
MEMPHIS 1714 Exchange Bldg.
MILWAUKEE 440 Barclay St.
MINNEAPOLIS 708 Builders Exchange Bldg.
NEW ORLEANS 1018 New Orleans Bank Bldg.
NEW YORK CITY 570-7th Ave.
PEORIA 103 Farmington Rd.
PHILADELPHIA 803 Land Title Bldg.
PITTSBURGH Empire Bldg
ST. LOUIS 4200 Forest Park Boul.
SALT LAKE CITY 204 Dooly Bldg.
SAN FRANCISCO 635 Mission St.
SEATTLE 326 Columbia St.
TOLEDO 415-13th St.

CANADIAN REPRESENTATIVES—Dominion Kewanee Boiler Company, Limited. 66 Richmond St., East, Toronto 2, Ontario

Steel Heating Boilers
Radiators, Tanks
Water Heating
Garbage Burners

*1000 Steel Boilers—Answering the "Call" for Dependable Kewanee Heat*



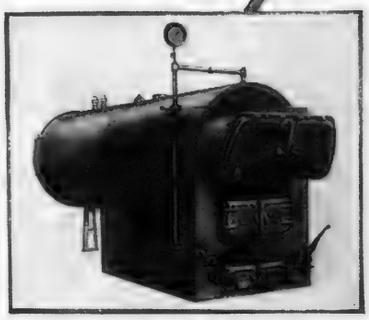

NEW YORK CITY

# *In New York's prominent buildings*

THROUGH the years, as new principles of construction justify themselves Titusville adopts them.

Today as during yesterday and as will be tomorrow, Titusville Boilers keep a step ahead —built better than the needs of today, but justified in their performances of tomorrow.

That is why you'll find them in many of New York's prominent buildings.



*Series "W" Welded Fire Box Boiler*

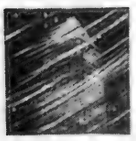
TITUSVILLE IRON WORKS CO.
Titusville, Pa.

TIW-5

# TITUSVILLE

## SERIES "W" WELDED, FIRE BOX

# BOILERS



# FLAX-LI-NUM

## OUTSTANDING FOR ITS GREATER INSULATING EFFICIENCY, SEALS THE ROOF OF THE FAMOUS FOSHAY TOWER BUILDING .... AGAINST HEAT LOSS

*Architects and Engineers*
MAGNEY & TUSLER, INC.

*Contractors*
NAT'L CONTRACTING CO. & MORRIS SCHUMACHER

*Roofer*
KRUCKEBERG ROOFING & CORNICE WKS.

*All of Minneapolis*

ALTHOUGH FLAX-LI-NUM enjoys a position of unusual predominance in the field of heat insulation for homes, due to the remarkable efficiency of the "two-air-space" method of application . . it is equally predominant in the field of roof insulation.

The many advantages . . both time and material saving . . which result from the semi-rigid form in which FLAX-LI-NUM is made, have been the basis of its selection for some of the outstanding American buildings . . The Foshay Tower Building at Minneapolis is but another testimonial to the superiority of FLAX-LI-NUM. 25,000 sq. feet of one-inch FLAX-LI-NUM seals the roof of this building against heat loss . . against heat penetration and moisture condensation.

In form . . in insulating value . . in permanence and ease of application, FLAX-LI-NUM satisfies the most exacting specifications. Let us send you our manual containing full authentic data and recommended specifications for application. It is called "Heat Insulation for Houses" but includes all types of construction.

FLAX-LI-NUM INSULATING CO., *St. Paul, Minnesota*

**Flax-li-num**

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

FLAX-LI-NUM INSULATING COMPANY HV-6
St. Paul, Minnesota
Send me complete information about Flax-li-num.
Also facts about the "two-air-space" method.

Name.....
Address.....
City..... State.....

Above illustration shows a typical Massachusetts Electric Propeller Fan installation for a plating shop, and at the right, for a kitchen.

# Better Air — Means a Bigger Day's Work

PURE AIR will stimulate your workers . . . keep them wide awake, and at the peak of their productive ability . . . . right up to quitting time. This will mean a bigger and better day's work from each man . . . . with an increase in profits to you.

The Massachusetts Electric Propeller Fan rapidly eliminates the impure air and odors, which lower bodily resistance and create fatigue, and replaces it with a constant flow of pure air. Properly placed in an office, store, factory, garage, kitchen, shop or public building, one of these fans will work wonders in the morale of the workmen who are being benefited by it.

This ventilating fan is built by an organization of heating and ventilating specialists whose products have earned a reputation for quality and efficiency over a period of the past half century. Our nearest sales offices will gladly go over your particular problem with you. Whether you require a single Massachusetts Fan installation or an entire new heating and ventilating system, you can count on Bishop and Babcock for results.

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# FOR HOUSE-HEATING WITH GAS THE ONE OUTSTANDING BOILER

# IDEAL GAS BOILER

EQUIPPED WITH

Throttling Gas Supply Valve—Vitreous Enameled Jackets
Pin Type Heating Sections—Controls of Simplest Design
Vapor-Tension Thermostatic Pilot

PRODUCT OF

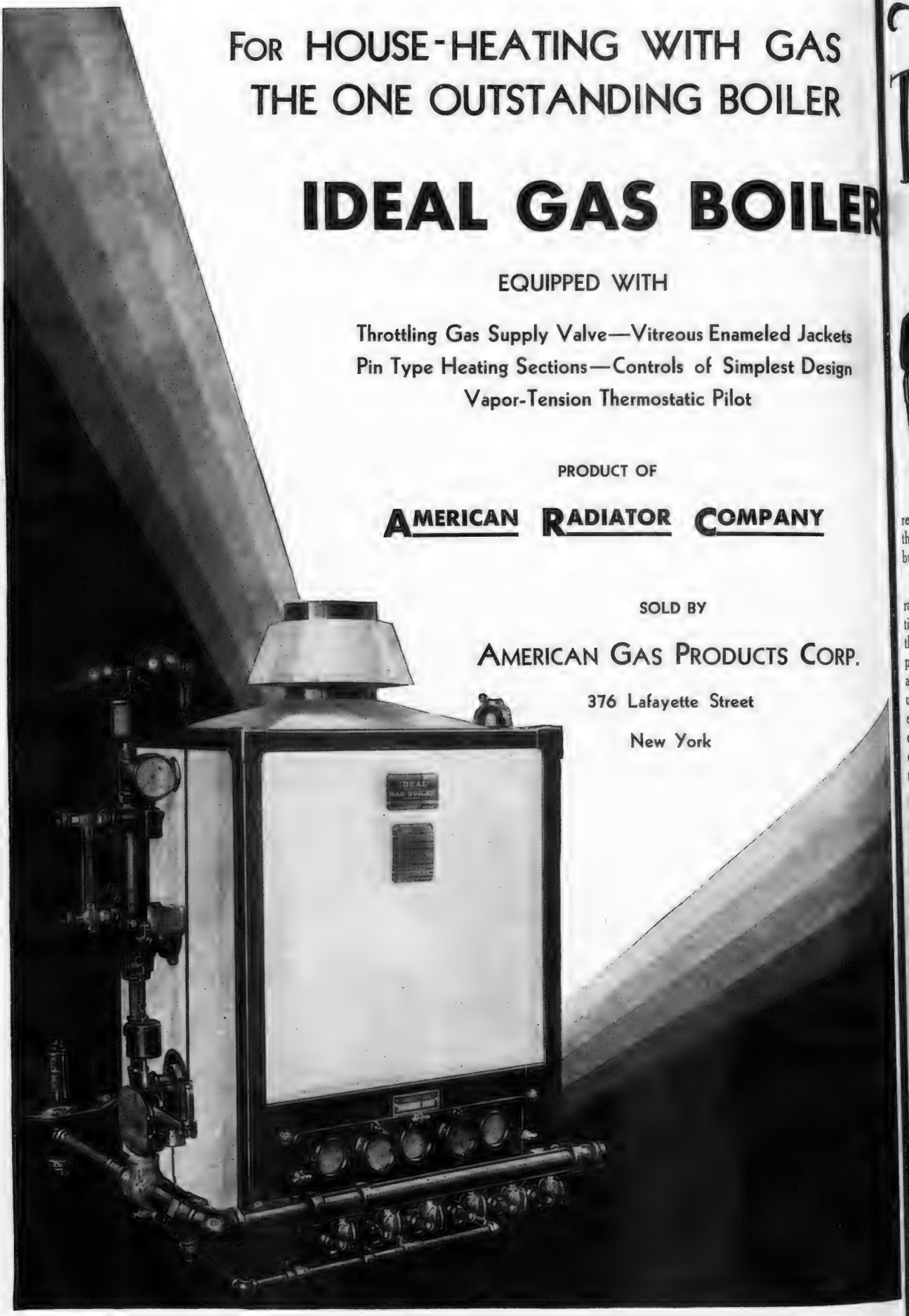
AMERICAN RADIATOR COMPANY

SOLD BY

AMERICAN GAS PRODUCTS CORP.

376 Lafayette Street

New York



# The Boiler for Oil-Burning

IN the burning of oil the Monarch Sectional Boiler has proved to be exceptionally economical. Because the sectional construction of Monarch Boilers will permit of their being made up into long sizes, with the resulting longer fire travel, they lend themselves admirably to use with oil-burners.

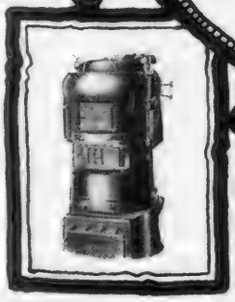
This unusually long fire-travel, arranged to carry the gases of combustion three times back and forth through the boiler, through flues presenting sensitive waterways on all sides to the action of the fire, utilizes the largest percentage of the effective heat units, giving the highest efficiency with the most economical consumption of whatever fuel it may be convenient to use.

Made in all sizes, for any heating requirement.

Ease of operation, cleaning and regulation.

And, years and years of service. Page Monarch Boilers are built to give a lifetime of service, and with good care and attention will outlast the building in which they are installed.

MONARCH STEAM BOILER EQUIPPED FOR OIL BURNING



## The Wm H Page Boiler Co

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Philadelphia, 1126 Washington Ave.
Cleveland, Rose Building
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Baltimore, 502 St. Paul St.
Factory: Meadville, Pennsylvania

General Offices: 200 MADISON AVE., NEW YORK CITY

# FOR HEAT and POWER PLANTS

# STANWOOD SMOKELESS BOILERS.

THE STANWOOD CORPORATION
Department D-69,
Cincinnati, Ohio

You may send me full particulars about the Stanwood Boiler;
.....Horse Power.....Pressure.

Name .....

City .....

State .....

# "—and be sure to include ETNA Welded Steel Pipe!"

**For plumbing or heating, "Etna" Welded Pipe is recognized as the standard of quality among building owners, architects and engineers alike.**

**Made by America's oldest pipe manufacturer and backed by a sterling record of service throughout industry, it is only natural that "Etna" Pipe should have the implicit confidence of discriminating buyers.**

**This famous pipe is available in every standard size from the smallest diameter to the largest—a pipe for every purpose.**

**Descriptive catalogue sent upon request.**

## SPANG, CHALFANT & CO., INC.

***General Offices:*** **CLARK BUILDING, PITTSBURGH, PA.**

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*Seamless Mills:*
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ETNA

# WELDED STEEL PIPE

SINCE 1828

# WING FEATHERWEIGHT

One Wing Unit Heating a Garage,
50′ x 100′, 17½′ High.

## Ability to Distribute Heat

Here is a striking example of the Wing Featherweight Unit Heater's ability to distribute heat. Since 1924 one medium sized unit has been heating this 50′ x 100′ garage in Michigan. All four walls are exposed and there is a large quantity of glass. The proprietors report that they have burned less coal with this Wing installation than they burned with the old heating system before the garage was enlarged from 65′ to 100 feet. They use the same cast iron boiler that was used for the smaller building, which was never properly heated even when the boiler was fired every thirty minutes. It is now fired four times a day.

It is impossible to think of a simpler installation or of one more economical of fuel. Only a Wing Unit with its directly overhead location and its remarkable Wing Scruplex Propeller Fan could deliver sufficient volume of warmed air, at sufficient velocity to circulate it over this wide area. The scientifically designed four-way discharge outlet is an important factor in the even distribution of heat over so wide an area from so low a level.

For ideal results with all types of industrial buildings you will find that it pays to use Wing Units. They offer you the widest variety of possible installations, dependable and remarkably efficient in operation. Write us for our new illustrated catalog giving complete information about the Wing System and its installation.

**L. J. WING MFG. CO., Dept. 6, 158 W. 14th Street, New York, N. Y.**

# UNIT HEATERS

MR. J. J. WALWORTH WAS SUMMONED TO THE WHITE HOUSE TO INSTALL A HOT WATER HEATING SYSTEM, IN 1853

# "Hell itself couldn't heat that corner"—*said* Andrew Jackson

But Walworth did it and has been continuously engaged in creative research for the solution of similar problems ever since.

Presidents of the United States, from John Adams to Franklin Pierce, had shivered successively in the frigid corners of the White House. General Jackson expressed himself on the subject with characteristic emphasis. It was not until 1853, however, when Mr. J. J. Walworth was called to Washington to install hot water heat, that the great mansion of our First Executives was made decently comfortable.

Since then, the Walworth Company has gone out of the business of actually installing heating systems, even for Presidents, and has extended its manufacturing services to the country at large.

Now, as then, Walworth makes and supplies valves and fittings and tools for every requirement of industrial and domestic heating and plumbing.

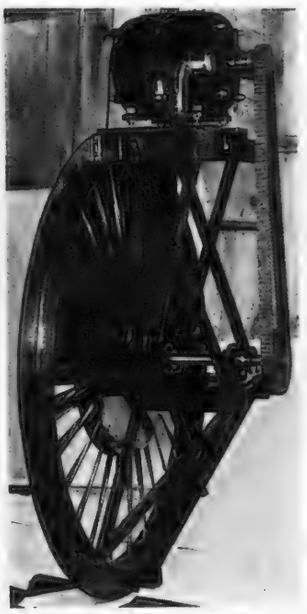
From a few hundred to many thousands of items, from one small factory to four great plants, from a single store to distributors all over the world—this is the record of Walworth's eighty-five years of supplying valves, fittings and tools for the domestic engineer.

# WALWORTH

**Walworth Company, General Sales Offices: 51 East 42nd St., New York**
**Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa.; and Attalla, Ala.**
***Distributors in Principal Cities of the World***
**Walworth International Co., 11 Broadway, New York, Foreign Representative**
**Walworth Company, Limited, 620 Cathcart St., Montreal, P. Q.**

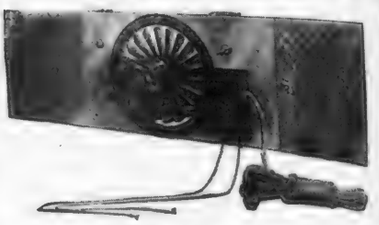
**30" Disc Pressure Fan**

2½ *H.P. 1140 R.P.M.*
1" *Static Pressure. Volume* 8000 *C.F.M.*



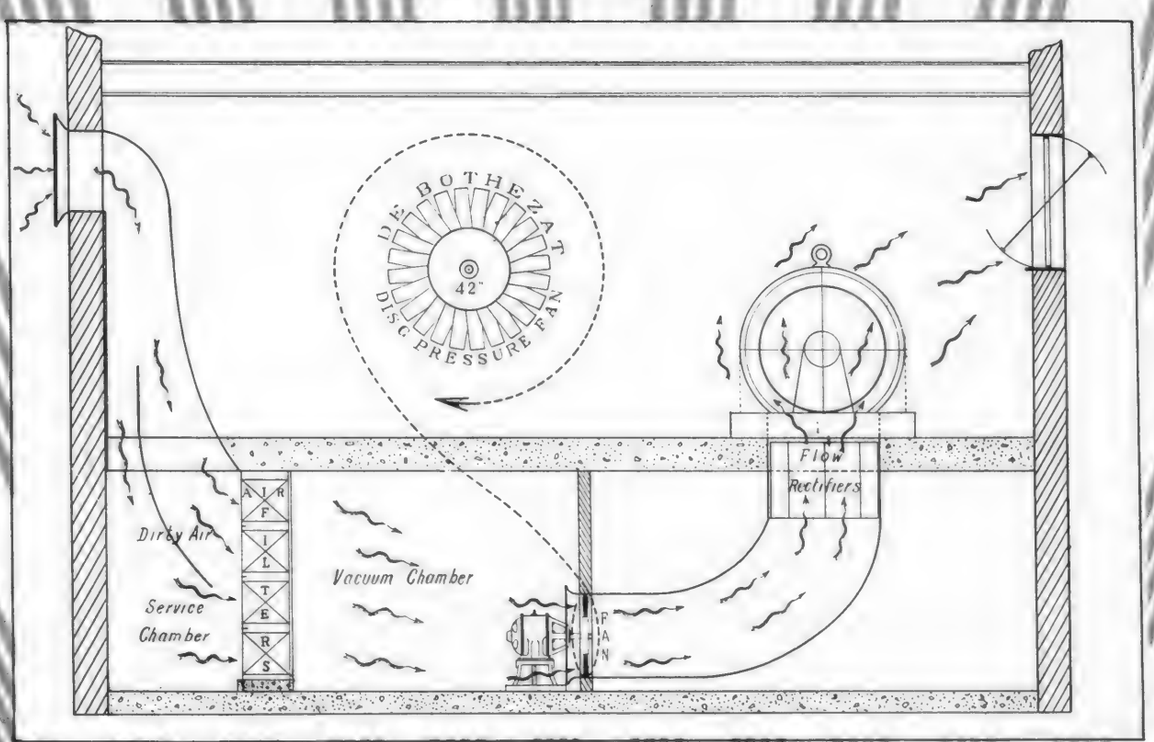
**48" Disc Pressure Fan**

5 *H.P. 630 R.P.M.*
1" *Static Pressure. Vol.* 15,000 *C.F.M.*



**"Little Imp"**
**Residential Kitchen Fan**

*Due to static pressure produced by this fan it will not only remove the cooking odors from the kitchen but will also ventilate the rooms adjacent to the kitchen.*

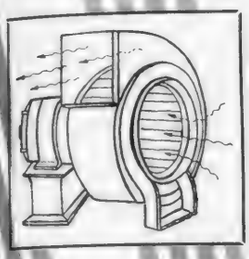


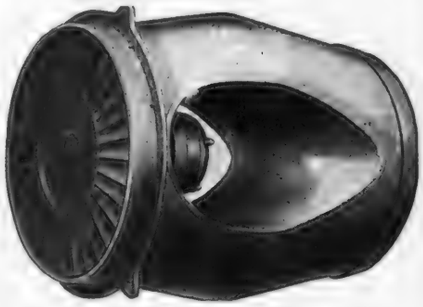

## INSTALLATION AT NATIONAL TUBE CO.

**De Bothezat Disc Pressure Fans delivered to the National Tube Company (Pittsburgh, Pa.) for cooling of electric generators. The air is sucked from outside through a battery of air filters into the vacuum chamber and thereafter forced through the generators. Nine De Bothezat Disc Pressure Fans operated by a total of 140 H.P., can deliver 120,000 C.F.M., each fan developing 3"** ***Static Pressure.***

**DE BOTHEZAT IMPELLER CO., INC.**

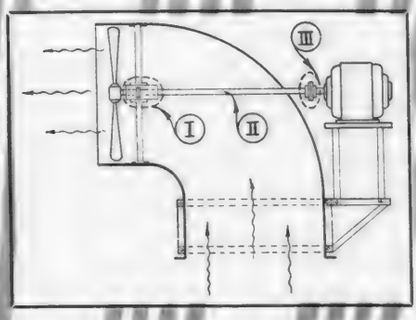
**1922 PARK AVENUE, NEW YORK CITY**





**De Bothezat Bifurcator**

*For special ventilating jobs where fumes of excessive temperature or corrosive character are to be removed.*




# ADVANTAGES OF THE BIFURCATOR
## Over extended shaft installation and blower

**With the extended shaft installation you are obliged to subject the airstream to a 90° turn and in addition you must use:**

**1—A bearing inside the airstream operating under very unsatisfactory conditions, especially when the airstream is very hot.**

**2—The undesirable long shaft.**

**3—A flexible coupling.**

**With the blower, although the motor is located outside the airstream, the same makes a 90° turn whether you need it or not. In addition, the blower's over-all dimensions greatly exceed the size of the discharge orifice.**

**With the bifurcator equipped with the De Bothezat Disc Pressure Fan all these disadvantages are totally eliminated.**

**A—The fan is directly mounted on the shaft.**

**B—No bearing inside the airstream.**

**C—No 90° turning of the airstream.**

**D—Very compact.**

**E—Motor perfectly isolated from airstream.**

**F—Can be set in any position, horizontal, vertical, or inclined.**

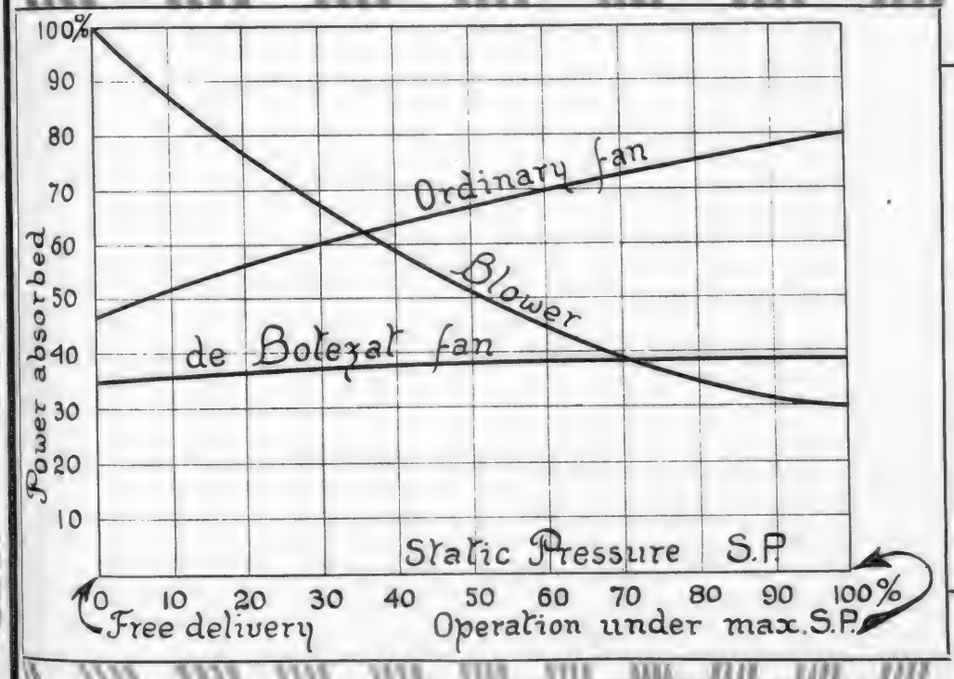



**Diagram illustrating the non-overloading power characteristic of De Bothezat Disc Pressure Fans**

The diagram gives the power curves plotted against static pressure for three different types of fans.

FOR THE ORDINARY DISC FAN: The power increases as the pressure increases.

FOR THE BLOWER: The power decreases as the pressure increases.

FOR DE BOTHEZAT DISC PRESSURE FANS: **The power is practically constant under any pressure from free delivery to no delivery. Thus:**

FOR THE ORDINARY FAN: The motor may be overloaded and may burn out if the static pressure increases (for example a wind blowing against the fan).

FOR THE BLOWER: The motor will overload and may burn out if the static pressure decreases (for example a leakage in the ducts).

FOR THE DE BOTHEZAT DISC PRESSURE FAN: **The power remains practically invariable under any pressure. This fan will never overload the motor. It is the ideal fan to be used with complete safety under any conditions.**

**DE BOTHEZAT IMPELLER CO., INC.**

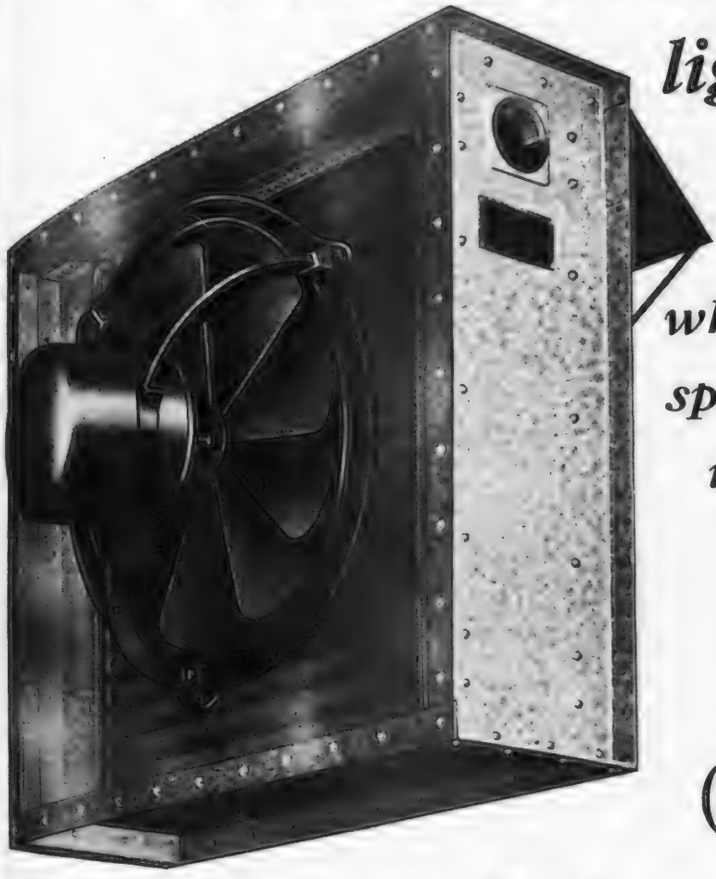
**1922 PARK AVENUE, NEW YORK CITY**

*THO Aerofin (The Standardized Light-Weight Fan System Heat-Surface) is but a quarter of a quarter-century old it is already the most widely used of all Fan System Heat-Surfaces, because it was originated by Fan Engineers to meet the specific requirements of present-day Fan Engineering and to anticipate those of tomorrow.*

*We take far greater pride in Aerofin's contributions to the advancement and broadening of Fan Engineering than in its commercial success. We knew in the beginning that success would follow incidentally if Aerofin were made more useful and dependable than any other available heat-surface. Therefore we shall continue our efforts to keep Aerofin ahead of your requirements so that whatever your genius may develop in the way of modern Fan System or Air Conditioning practice we'll have ready a heat-surface that will be as adaptable and dependable as Aerofin is today. Here's to the next quarter-century!*

*Aerofin Corporation,*
*L. C. Soule, Chief Engineer*
*H. D. Jackes, Sales Manager*

# —and the modern light-weight Unit Heater,



*which has revolutionized space heating practice, is the direct offspring of*

## AEROFIN

*(The Standardized Light-Weight Fan System Heat-Surface)*

## *To make sure that you select the right Unit Heater all you need do is make sure that the Heat-Surface is AEROFIN**

**In Unit Heaters offered by these leading Manufacturers the Heat-Surface is AEROFIN**

B. F. Sturtevant Company, Boston, Mass.
Buffalo Forge Company, Buffalo, N. Y.
Clarage Fan Company, Kalamazoo, Mich.
American Blower Corporation, Detroit, Mich.
Ilg Electric Ventilating Company, Chicago, Ill.
Garden City Fan Company, Chicago, Ill.
Canadian Blower & Forge Co., Kitchener, Ont.
Sheldon's, Limited, Galt, Ont.
Canadian Sirocco Co., Windsor, Ont.
B. F. Sturtevant Co. of Canada, Ltd., Galt, Ont.

**Made in 3 Types and more than 60 Standard Encased Unit Sizes, for pressures up to 350 lbs. gauge*

***Write to any of above for Unit Heater Data or to us for Aerofin information. Ask for Bulletin V-69***

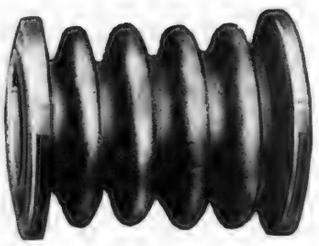
## AEROFIN CORPORATION

Burnham Building, CHICAGO
Land Title Building, PHILADELPHIA
850 Frelinghuysen Avenue, NEWARK, N. J.
11 West 42nd Street, NEW YORK
United Artists Building, DETROIT
Oliver Building, PITTSBURGH
Paul Brown Building, ST. LOUIS

*AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus*

# Pioneering Steps That Have

1



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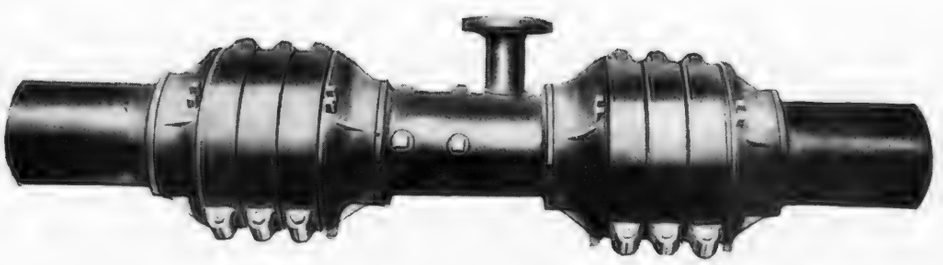

BADGER'S work on expansion joints goes back many years.

During this period, Badger engineers have brought out a number of important improvements ... improvements that have added to the dependability of expansion joint practice and greatly broadened the usefulness of joints to the industries.

For example, consider these developments:

*1 Uniform Corrugations*

One of the earliest improvements was to control the uniformity of the corrugations both as to depth and to the thickness of the metal.

Where formerly, corrugations were made by "bumping," Badger developed a process whereby they were given uniform depth and a very uniform thickness of metal.

This at once increased their dependability and life.

*2 Protected Corrugations*

Next in line of important improvements was the "equalizing ring" which acts to limit the flexing of each corrugation and prevents unequal distribution of the stresses.

Another feature of these rings is of importance in connection with high pressure work. It will be noted that they act as a backing for the metal over practically the whole surface.

*3 Monel Metal Sleeves*

Superheated steam calls for some protection to the copper tubing. In their studies of this problem, Badger engineers

**Branch Offices**

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Syracuse, N. Y.....404 So. Clinton Street
Minneapolis, Minn....716 Builders Exchange
Charlotte, N. C.....1408 Realty Bldg.
Denver, Colorado.....414 W. Colfax Ave.
Chicago, Ill.....2831 South Parkway
Cleveland, Ohio.....Guardian Bldg.
Cincinnati, Ohio.....Union Trust Bldg.
Atlanta, Georgia.....Red Rock Bldg.
Salt Lake City, Utah.....Kearns Building

# Improved Expansion Joints

found that a Monel Metal Sleeve afforded this protection in a most satisfactory manner.

With the advent of this improvement came a marked increase in the life and usefulness of corrugated copper expansion joints for superheated steam work.

*4 Welded-End Joints*

The coming of welded pipe line meant the coming of a Welding Type Expansion Joint. It came from the Badger shops.

This type Badger Joint is one of the more recent improvements in the general work on expansion joints. It lends itself to the installation of double units and for the tapping of the line between units for service outlets.

Badger's work on expansion joints has been of a most practical nature. Every change has been to add to the usefulness of the joints. In some of these changes, the needs of industry have been anticipated.

Standard Badger Self-Equalizing Joints are made up to 30″ size. Send for further information. It will show you why so many companies use Badger Joints ... why, for instance, one company alone has installed more than 3,000 units.

## E. B. BADGER & SONS CO.

67 Pitts Street, BOSTON, MASS.

**Branch Offices**

Philadelphia, Pa.....1500 Walnut Street
Detroit, Michigan.....1728 Ford Building
St. Louis, Mo.....3605 Laclede Avenue
Houston, Texas...1308 2nd Nat'l Bank Bldg.
San Francisco, Cal. .....Sharon Bldg.
Pittsburgh, Pa.....Union Trust Bldg.
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BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · TRADE MARK · E. B. BADGER & SONS COMPANY

# COIL

**STEEL HEATING BOILERS AND WATER HEATERS**

# FOR OIL BURNING

Coil Boiler economy and efficiency are today more or less taken for granted. Hundreds of letters to us show that Heating Contractors are thoroughly acquainted with the fact that Coil Boilers are more efficient and economical because of the great heat absorbing area exposed to the living flame. But there is something else you give your customer when you sell him a Coil Boiler. That is—convenience. A boiler he doesn't have to worry about. A boiler that requires the absolute minimum of attention. A boiler trouble-proof and fool-proof. How can he help but be satisfied?

IF desired the Coil Boiler can be fitted with grates, etc., in thirty minutes' time.

*Write us for complete specifications and details*

**MONITOR BOILER COMPANY, 1505 Race St., Philadelphia, Pa.**

Univent *and* Glass *make the difference*

,, no other ventilator gives

# UNIVENT

(TRADE MARK)

## VENTILATION

# Obvious,,,

## *to the trained engineering mind*

IN FEW FIELDS does the *trained mind* play a part of more importance than in heating and ventilating. The layman knows little of the mechanics of any system; he seeks only—results.

Large credit is due, therefore, to the heating and ventilating engineer for the nation-wide acceptance of the Univent. There are other systems of unit ventilation which simulate the Univent—but none that can possibly duplicate Univent results, for Univent features are exclusive to the Univent. The engineer has examined the facts and knows the difference.

The Univent is a complete individual ventilation machine built by an organization of specialists in heating and ventilating equipment. It draws air direct from out-of-doors, cleans it, warms it to a comfortable temperature, and silently delivers it throughout the room with agreeable air motion, but without drafts.

Let us tell you of results being accomplished through Univent Ventilation in schools, office buildings, banks, hospitals, and similar buildings. Write for engineer's edition of "Univent Ventilation." The Herman Nelson Corporation, Moline, Illinois.

# Our Contribution
## to the art of Heating & Ventilation

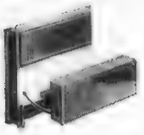
SIX YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable. The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING ◥ VENTILATING ◥ COOLING ◥ DRYING ◥ CONDENSING

**UNIVENT**

for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

**HERMAN NELSON** *Invisible* **RADIATOR**



... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

**THE HERMAN NELSON hiJet HEATER**

It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

**Herman Nelson Radiator Sections**
*for Blast Heating and Cooling*

Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof. May be arranged in banks to solve any special problem of heating or cooling.

**THE HERMAN NELSON CORPORATION ◥ *Moline, Illinois***

*Builders of Successful Heating and Ventilating Equipment for over 20 Years*

*Sales and Service*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BELFAST, ME. | UTICA | SCRANTON | SAGINAW | CINCINNATI | DES MOINES | ST. LOUIS | DALLAS | DENVER | SEATTLE |
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| PROVIDENCE | PHILADELPHIA | CHARLOTTE, N. C. | CLEVELAND | INDIANAPOLIS | GREEN BAY | ATLANTA | EMPORIA | SPOKANE | VANCOUVER |
| NEW YORK CITY | WASHINGTON, D. C. | GRAND RAPIDS | COLUMBUS | CHICAGO | MINNEAPOLIS | MEMPHIS | KANSAS CITY | PORTLAND | TORONTO |
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# Are you making enough money?

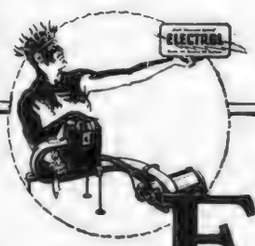
## *There's new profit for you in cooperating with the Electrol dealer*

HEATING contractors everywhere are stepping up their incomes by means of the Electrol cooperative plan. They are the kind of business men who do not overlook a chance to make additional entries on the profit sheet. They have arranged with their local Electrol dealer to make money from the sale of Electrol Oil Burners to their customers.

The same proposition is open to you. No investment is required; no increase in equipment or overhead. You do not have to become an oil burner dealer; you do not handle installations or service. But—and this is the important thing—you do get the commissions. The idea fits right in with your regular business. Your influence and Electrol's reputation work hand in hand.

The Electrol Sales and Service Representative in your city will be glad to explain full details of the working arrangements which will provide a new source of income for you. If you don't know him, write us and we will have him get in touch with you.

ELECTROL INCORPORATED
177 Dorcas St. St. Louis, U. S. A.




# ELECTROL

*The* OIL BURNER *with the Master Control*

LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

MEMBER
OIL HEATING
INSTITUTE

1888

# The history of Vacuum Systems of Steam Heating is a history of Warren Webster & Company

Webster Systems of Steam Heating combine the service of a national organization of steam-heating specialists—a complete line of more than thirty steam-heating appliances, including Webster Return Traps, Packless Radiator Supply Valves, Heavy Duty Traps and related appliances—together with Webster engineering methods which insure correct application.

WARREN WEBSTER & COMPANY, Camden, New Jersey
*Pioneers of the Vacuum System of Steam Heating...Founded 1888*
52 U. S. Branch Offices...*In Canada, Darling Bros., Ltd., Montreal*

1929

In 1888, Warren Webster & Company introduced the Webster Vacuum System of Steam Heating. Even in its early crude form the then "new idea" achieved marked success. It was fundamentally right for the needs of the day.

Through forty-one years this system has been steadily improved to meet changing needs. Today there are more than fifty thousand Webster Systems heating America's finer-type buildings.

Essential to the fullest development of the Webster Vacuum System was a radiator return trap of certain characteristics. Steady progress toward that end resulted in the production of the Webster Sylphon Trap, introduced in 1910.

Since that time Webster engineers have made many improvements and refinements in the original Sylphon Trap. But the test of time and service has proven the correctness of the fundamental design.

To date more than three million Sylphon Traps have been installed. Of this total less than one-half of one per cent have been recorded as replaced for all causes.

More than forty years ago, when even the idea of service was new to business, Webster saw the necessity for service to insure correct application of Webster Systems, and began building up an organization of steam-heating specialists.

This organization, which now includes nearly three hundred experienced engineers, trained to Webster standards, and located at fifty-five convenient points, renders Webster Service.

Webster service works with architects, engineers, heating contractors and building owners—from the preliminary plannings stage until *after* the installation is an assured operating success.

The Webster Moderator System of Steam Heating—for large buildings—is the latest result of pioneering and long organization experience, plus three years of concentrated research. This Moderator System measures the quantity of steam delivered to each radiator in accordance with outside temperatures and inside demands. In limited production only this year. Details on request.

WARREN WEBSTER & COMPANY, Camden, New Jersey
*Pioneers of the Vacuum System of Steam Heating...Founded 1888*
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# Handy as a Flashlight

A FLOOD OF HEAT—instantly—where you want it—when you want it—over your entire floor area or part of it. A turn of a switch—you have heat. Another and it's off. The operation of Modine Unit Heaters is as simple as the use of a pocket flashlight.

Modine Unit Heaters are suspended from the steam line. From a height of from 10 to 14 feet they distribute the heat *down* and *keep it down*. They furnish healthful, comfortable heat—no cold spots—no overheating . . . They cost less to buy and less to operate. Let us send you complete facts today.

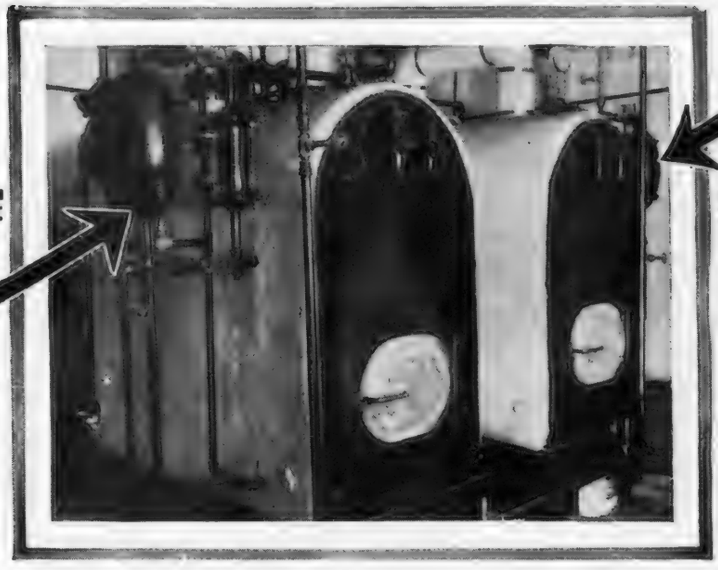
MODINE MANUFACTURING COMPANY
1707 Racine St. *(Heating Division)* Racine, Wis.
*Branch Offices in all Large Cities*
*London Office:* — S. G. Leach & Co., Ltd., 26-30 Artillery Lane

MODINE UNIT HEATER
*Model No. 701*—weighs only 130 pounds, replaces approximately two and one half tons of cast iron radiation.

# Modine Unit HEATER

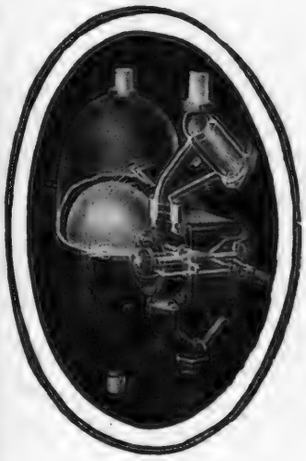
A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS



*Two McDonnell & Miller Self Cleaning Feeders in the National Education Association Building, Washington, D. C.*

# Without feeders the job is *not complete*



***The "Rolls-Royce" of Feeders—***

When you look at the McDonnell & Miller Feeder you see a totally new standard of feeder design and construction. It has only one float—only one moving unit. The feed water does not enter the feed chamber but is fed with full city pressure behind it, exactly as if the feed-valve were manually operated. The fewer parts are made with machine-tool precision. Each feeder is factory tested under actual operating conditions before shipment. It is built for continuous unfailing service—and gives it.

A consulting engineer stated that he did not consider his responsibility completely discharged until he had made sure that every heating boiler under his supervision was equipped with a *good* duplex feeder!

Three years ago he would not have made that statement. But in the meantime the duplex feeder has been writing its own testimonials—has shown, on the job, that it is the best kind of boiler protection—the greatest and cheapest insurance against cracked sections and burned boilers. Today this engineer's opinion merely reflects the trend of all good engineering authority.

Who can deny that in bringing the duplex feeder to the position it now occupies, the McDonnell & Miller feeder has been the moving force? Particularly in the new M & M *Self-Cleaning* Feeder the McDonnell & Miller organization has proved that it is possible to build a duplex feeder which will meet every service condition, every emergency, and every condition of feed water. Rotary self-grinding valves to insure self-cleaning; larger capacity to protect against broken circuits to the condensation pump; adjustable water levels and differentials—these are only a few of the features that have brought a new conception of worth and dependability.

### Guaranteed for full year

So flawless has been the record of this feeder that it is now guaranteed for a full year. The graphs and other data in our catalog will interest you. The catalog is as close as the coupon below. Remember that the job is not complete until you install or specify McDonnell & Miller Self-Cleaning Feeders for every boiler.

**McDonnell & Miller, 710 Wrigley Bldg., Chicago**

**McDONNELL & MILLER**

*SELF-CLEANING*

**Duplex Feeder**

*"Doing one thing well"*

McDONNELL & MILLER,
710 Wrigley Bldg., Chicago
Please send a copy of your booklet to:
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Individual
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City and State
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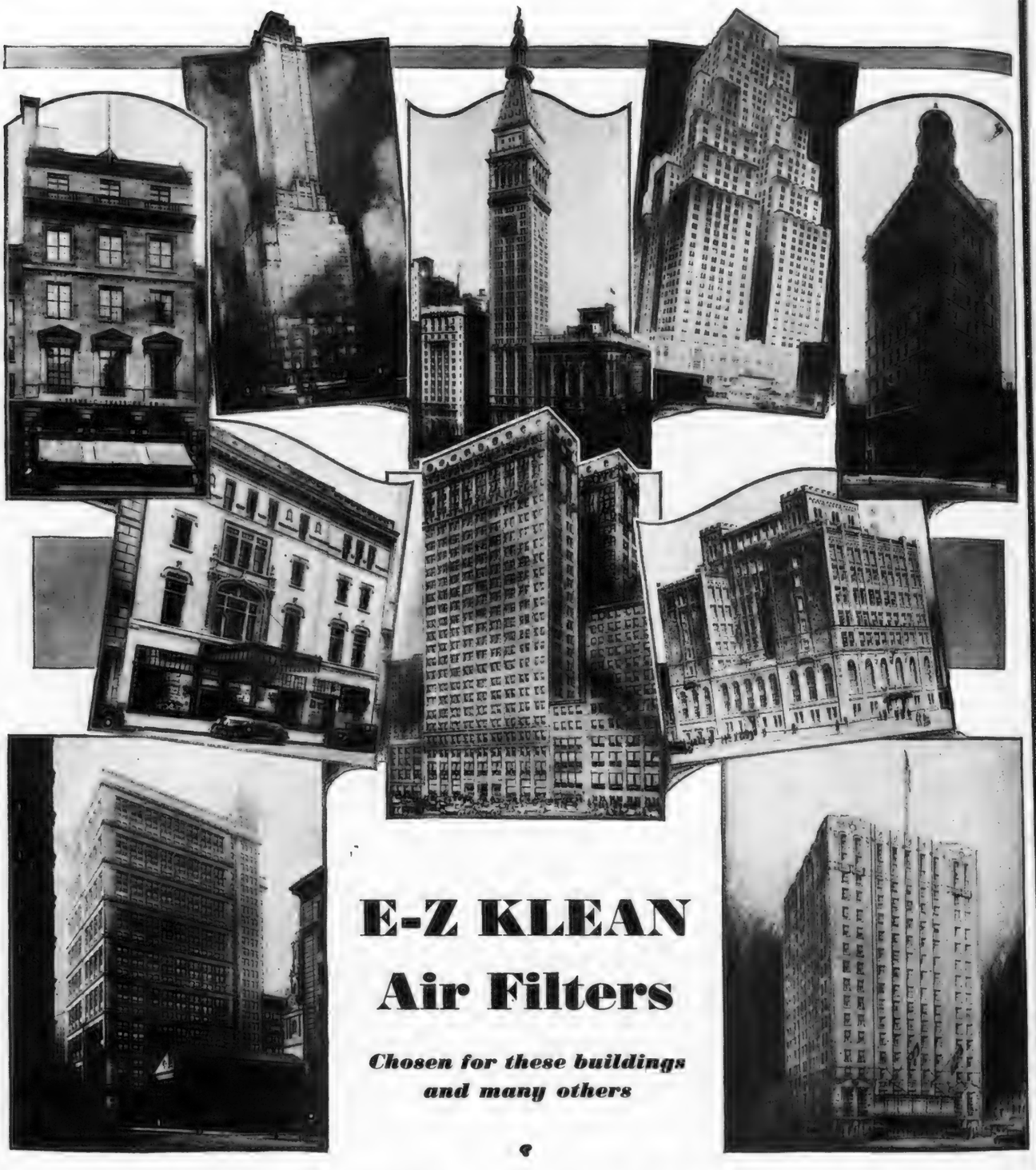


# E-Z KLEAN Air Filters

***Chosen for these buildings and many others***

**Automatic Flow or Cell Type**

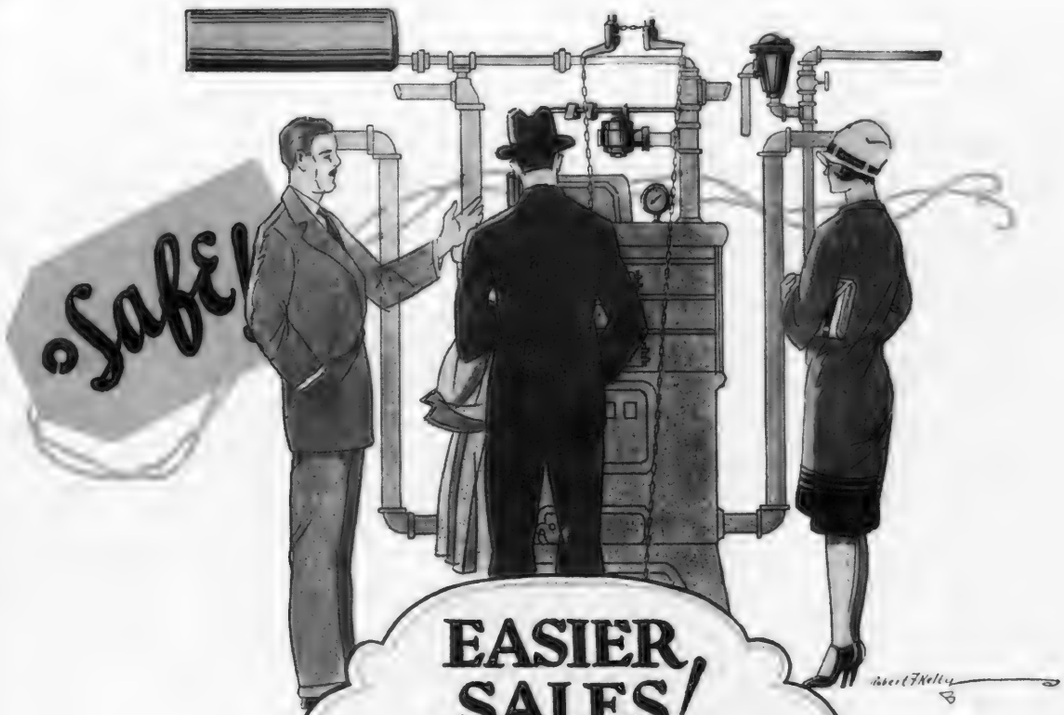
## NO SLUDGE REMOVAL PROBLEMS

**AIR FILTRATION CORPORATION**

**ENGINEERS AND MANUFACTURERS**

***An Independent Organization***

**149 Broadway NEW YORK**




# EASIER SALES! ..and here is the reason

THERE'S no trick about selling a Hot Water Heating job Thrush Equipped ♛ The added convenience of the Thrush regulation is a definite contribution to home comfort ♛ The safety is positive ♛ Economy of fuel consumption is startling as compared to gravity, hot water, or other forms of heating ♛ The installation cost is lower than for the ordinary expansion tank and reduced pipe sizes completely offset the cost of the Thrush System. ♛

### *Added Equipment that Costs the Owner Nothing!*

*It's true!* You can offer a Thrush Equipped Hot Water Heating job—*a closed system with higher efficiency, plus automatic regulation*—at no higher cost than your competitor asks for a gravity job without any regulation at all ♛ Isn't that a wonderful selling argument? ♛ Can't you build volume and profit with equipment that costs nothing more than the ordinary equipment which it replaces, yet pays you a greater profit, reduces your installation costs and wonderfully improves operation? ♛

### *Better Heating that Brings New Friends*

Best of all, every Thrush Equipped Hot Water Heating plant that you sell is *a continuous advertisement for your service* ♛ It makes a friend for you and these friends tell their friends and establish new prestige for your business ♛

This isn't theory for thousands of jobbers and dealers everywhere have proved it beyond question of doubt ♛

Thrush Equipment can be put on old or new plants to convert a gravity job into a closed or pressure system with the tank in the basement and automatic regulation of dampers ♛ The compact installation all goes on or near the boiler, requiring only six feet of pipe and seven connections ♛

### *Ask Your Jobber About It*

Thrush System is sold by good jobbers throughout the United States and Canada ♛ Ask your jobber's salesman to tell you about the Thrush plan for helping dealers sell—or mail the coupon below and we will have your jobber tell you about it ♛

# THRUSH SYSTEM OF HOT WATER HEATING

*New Homes or Old—*

MAIL THIS COUPON!

*H. A. THRUSH & CO., Peru Indiana*

*Gentlemen:* Please send me illustrated catalog and other data on Thrush Equipment and tell me about your advertising and selling helps for dealers.

*Name*_____

*Address*_____

*My Jobber is*_____

*They're Prospects*

*The Sign* B&J *of Quality*

# QUALITY HEATING

QUALITY in a Heating System pays generous dividends—in Comfort, Convenience, Noiselessness, Cleanness, Satisfactory Operation and Permanent Efficiency.

QUALITY costs *very little more,* even in the initial expense of installation—and in economy of fuel consumption it makes up the difference in price many times over during years of Satisfactory Service.

## Barnes & Jones

*The Sign* B&J *of Quality*

Vapor and Vacuum Heating Systems of Proven Quality
Backed by 30 Years' Experience as Heating Engineers and Manufacturers

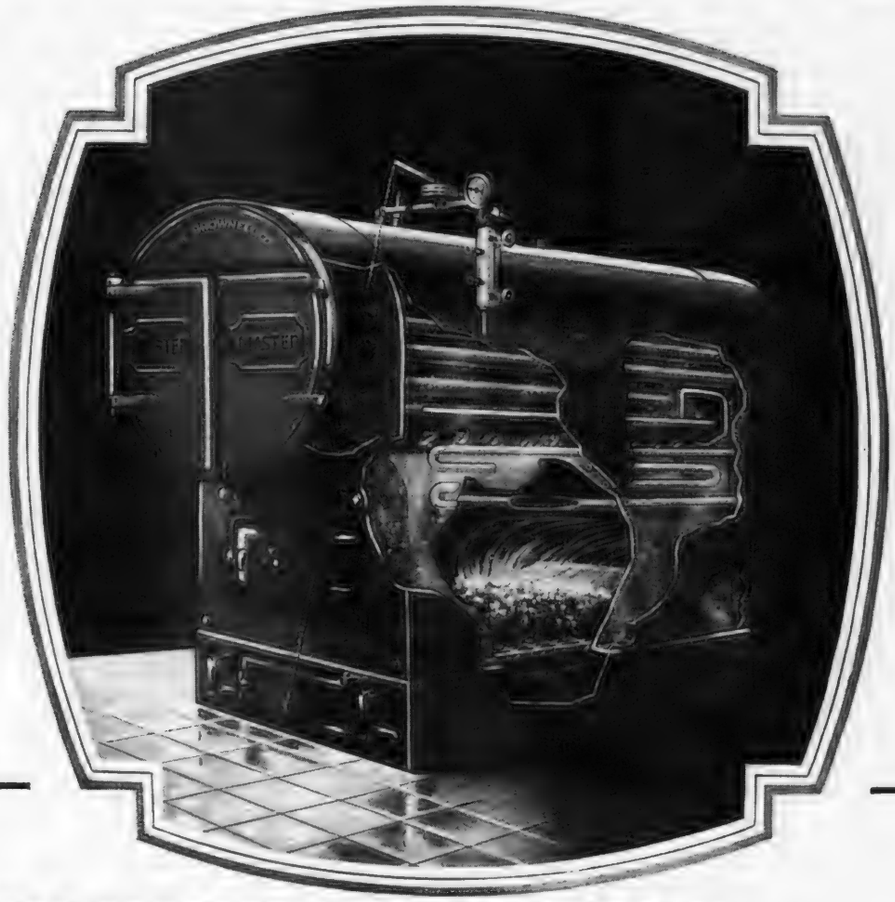
**128 Brookside Ave.**
**Jamaica Plain, Boston**

**101 Park Ave.**
**New York City**

# Brownell

## Electric Welded Steel

# Boilers



## SUPERIOR FEATURES YOU WILL APPRECIATE

"A step forward" sums up the comments of architects and engineers familiar with the various special features embodied in the BROWNELL welded steel boiler.

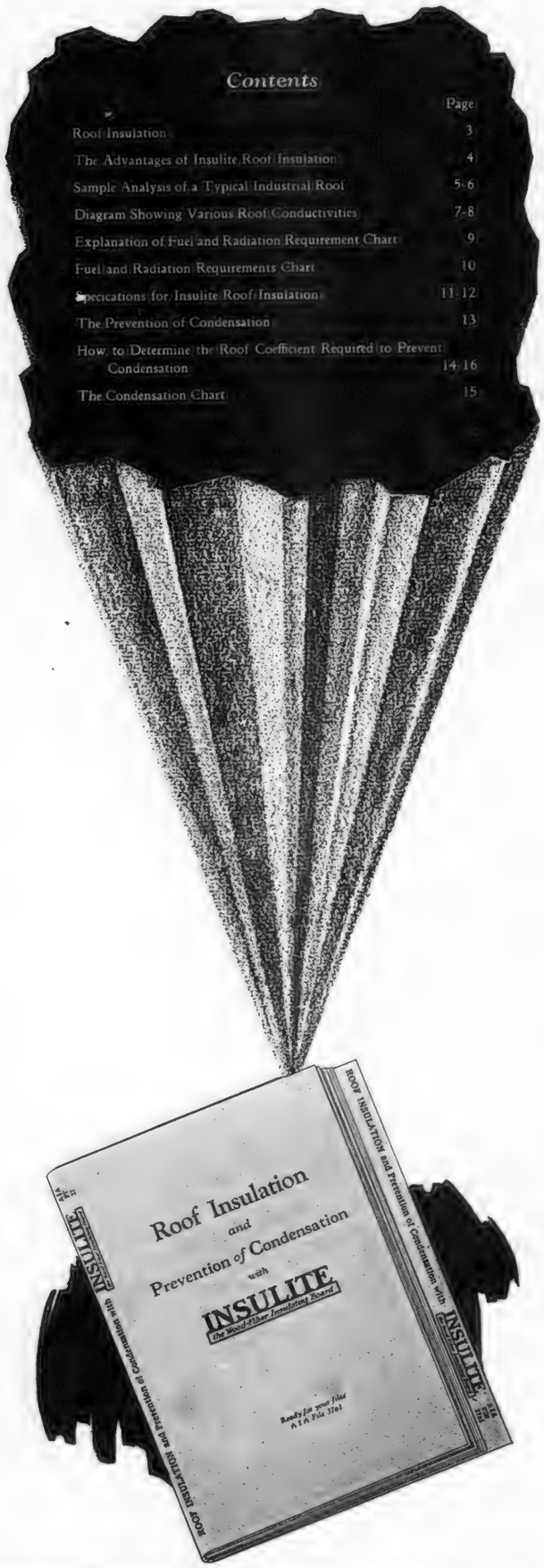
One of these is the tapered water legs, which are larger at the top than at the bottom This construction allows for the natural expansion of the water as it takes up heat in its travel upward thru the "legs." In this way the usual resistance to expansion is lessened with consequent improvement in the entire circulation system.

Another is the provision of considerably more radiant heating surface than usual. Still others are the double section economy grates, and the installation of the service coils in the upper part of the tapered water legs. This last feature makes it possible to have hot water in mild weather without keeping up a full head of steam (low fire sufficient). It also eliminates installation of an auxiliary hot water heater.

This equipment is built for either coal or oil firing, or both at the same time, and is fully illustrated and discussed in special Bulletins ready to mail.

THE BROWNELL COMPANY *Founded 74 Years Ago* Dayton, Ohio

REPRESENTATIVES IN PRINCIPAL CITIES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Roof Insulation
and
Prevention of Condensation
with
INSULITE
the Wood-Fiber Insulating Board
Ready for your files
8½ x 11 Pile Size

# *Answers to Insulation Questions*

Note the Page of Contents from the portfolio—"Roof Insulation and Prevention of Condensation with INSULITE."

Ten chapters and charts that will be of great help in the solution of any roofing job in its relation to heating and ventilating.

INSULITE has unusual strength—great heat-resisting value—is easy to handle and work with. Not injured by moisture and exposure. Breakage waste is eliminated.

Send for your free copy of this portfolio.

The INSULITE engineering staff will be glad to give assistance in connection with any special heating problem you may have. No obligation.

**INSULITE**
*the Wood-Fiber Insulating Board*

**THE INSULITE COMPANY**
**1204 Builders Exchange**
**Dept. No. 9**
**MINNEAPOLIS, MINN.**

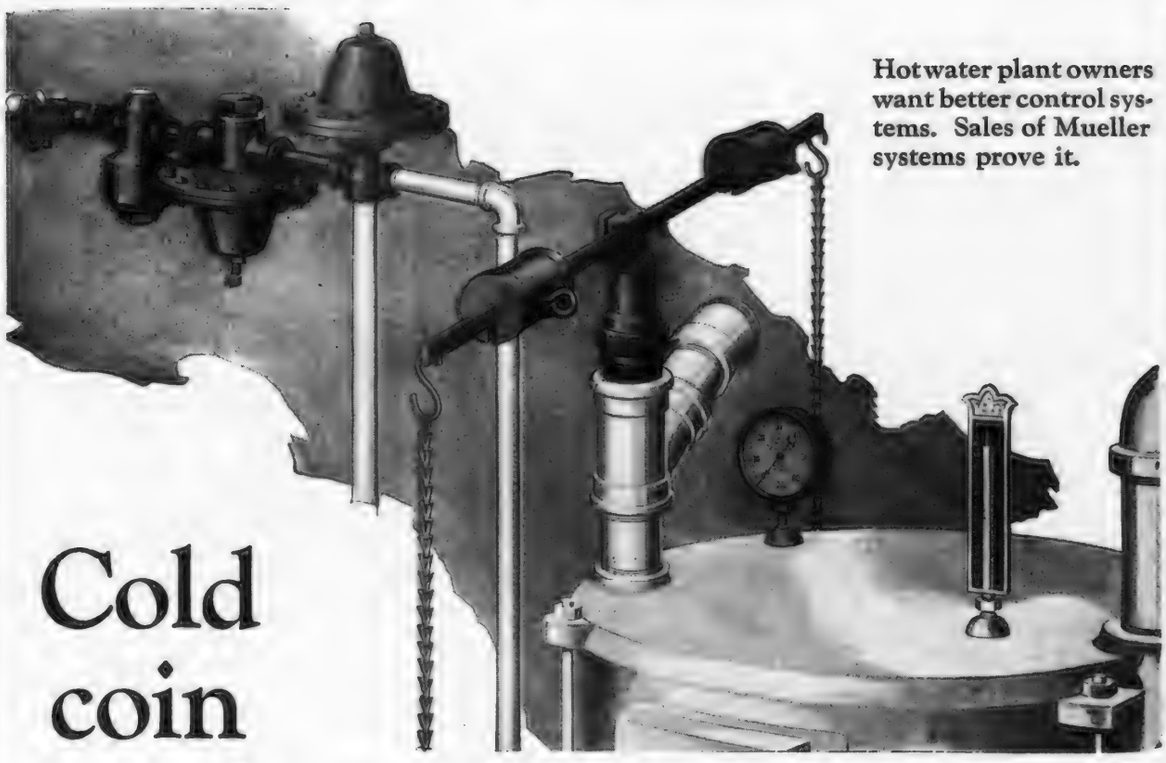
THE INSULITE COMPANY,
**1204 Builders Exchange, Dept. No. 9,**
Minneapolis, Minn.

Please send your Roof Insulation Portfolio to

Name.....

Address.....

City.....State.....



Hot water plant owners want better control systems. Sales of Mueller systems prove it.

# Cold coin *from hot water!*

Sounds unreasonable, but heating contractors who are handling the Mueller Automatic Control for hot water plants have the evidence in the bank.

Dealers are making more money on the Mueller heat control system. They are installing them with less labor and in less time, on both new and old jobs, than is possible on any expansion tank that was ever put in.

Owners profit by them, too, by getting automatic heating systems that give more heat and burn less fuel at a cost no greater than with the old, inefficient expansion tanks.

There is a rich market for this new specialty in your territory, both on new plants and on replacements. Write us today for complete information on how you can get your share.

Mueller Co., (Established 1857) Decatur, Illinois. Branches: New York, Dallas, San Francisco, Los Angeles. Canadian Factory: Mueller, Limited, Sarnia.

MUELLER

AUTOMATIC HOT WATER HEAT CONTROL

# In Dry Kilns Celotex means *Economical and Efficient Operation*

***Celotex Industrial Insulation Board is easily applied to any common type of construction.***

INSULATION of the walls and roofs of dry kilns with Celotex eliminates fuel waste ... prevents condensation ... simplifies the maintenance of high temperatures.

Celotex Industrial Insulation Board is extensively used for this purpose because of its high insulating efficiency, and because it is so easily applied to any type of construction.

In frame construction, Celotex is nailed directly to the studs, joists or rafters. A two-ply (⅞″) thickness of Celotex applied to each side of the framing is sufficient under average conditions.

In masonry construction, Celotex is nailed to wood furring strips. Where hollow tile is used the boards are placed between the two layers of tile.

For roof insulation, Celotex can be applied either under or over the rafters or ceiling joists. When the construction is concrete or some other masonry, the Roof Insulation Board is most easily applied over the roof deck and under the built-up roof covering.

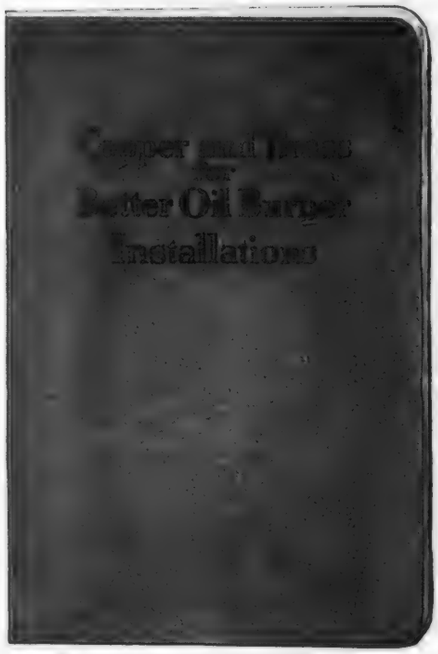
*Here is a large dry kiln that operates more efficiently the year 'round, because the walls and roof are insulated with Celotex Industrial Insulation Board.*

The thickness of Celotex required for any particular kiln may be accurately determined ... and depends on the inside and outside temperatures, the inside relative humidity and the type of uninsulated construction. Our engineering staff will gladly assist you in solving problems of this nature.

THE CELOTEX CO.
919 N. Michigan Ave., Chicago, Ill.
*Mills*: New Orleans, Louisiana
*Branch Sales Offices in many principal cities (See telephone books for addresses)*
*Sales Distributors throughout the World*
*In Canada*:
Alexander Murray & Co., Ltd., Montreal

**CELOTEX**
BRAND
INSULATING CANE BOARD
INDUSTRIAL INSULATION

The word CELOTEX (Reg. U. S. Pat. Off.) is the trademark of and indicates manufacture by The Celotex Company, Chicago, Ill.




# A BOOK OF INTEREST TO THE OIL BURNING INDUSTRY

ONE of the functions of this Association is to cooperate with manufacturers using Copper and Brass in the manufacture of its products.

The oil burning industry in perfecting its product to a high standard of efficiency has as a natural course turned to the use of Copper and Brass equipment.

"Copper and Brass for Better Oil Burner Installations" is the title of a book containing much valuable information to the industry in general. Copies will be off the press within a few days and will be mailed without cost or obligation to manufacturers, dealers, accessory manufacturers and service managers.

**COPPER & BRASS**
RESEARCH ASSOCIATION
25 Broadway, New York

*Midwestern Office:* Landreth Building, St. Louis, Mo.
*Canadian Office:* 67 Yonge Street, Toronto, Ont.
*Pacific Coast Office:* Architects Building, Los Angeles, Calif.

COPPER, BRASS, BRONZE — *The World's Most Useful Metals*

# 25 Years

1904

## The Unfolding Up-Trend.

The open hearth of feudal days was better than a bonfire—the copper warming pan, tin foot warmer and chimney fireplace of Colonial times still better—the use of stove and furnace were upward steps.

But to-day, the IDEAL Steam and Water Boilers with the highly perfected AMERICAN Radiators mark the apex of modern comfort with rational economy.

IDEAL 18-inch Steam Boiler

**IDEAL Boilers**
**IDEAL Tank Heaters**
**AMERICAN Radiators**

**American Radiator Company**

General Offices: 282-284 Michigan Ave., Chicago

New York, 42-44 E. 20th St. Boston, 44 Oliver St. Philadelphia, 622 Arch St.
Buffalo, 206 Mutual Life Bldg. St. Louis, 207-209 N. 10th St.
Minneapolis, 204 4th St., South Denver, 831 15th St. Seattle, 502 Lumber Exchange
Washington, 1201 G St., N. W. Cincinnati, 336 W. 4th St.
Pittsburg, 926 Farmers' Bank Bldg. Milwaukee, 126 Sycamore St. London, 89-90 Shoe Lane
Omaha, 417 S. 15th St. Chicago, 282 Michigan Ave.

**JUNE, 1904**
**HEATING & VENTILATING MAGAZINE, *First* Issue**

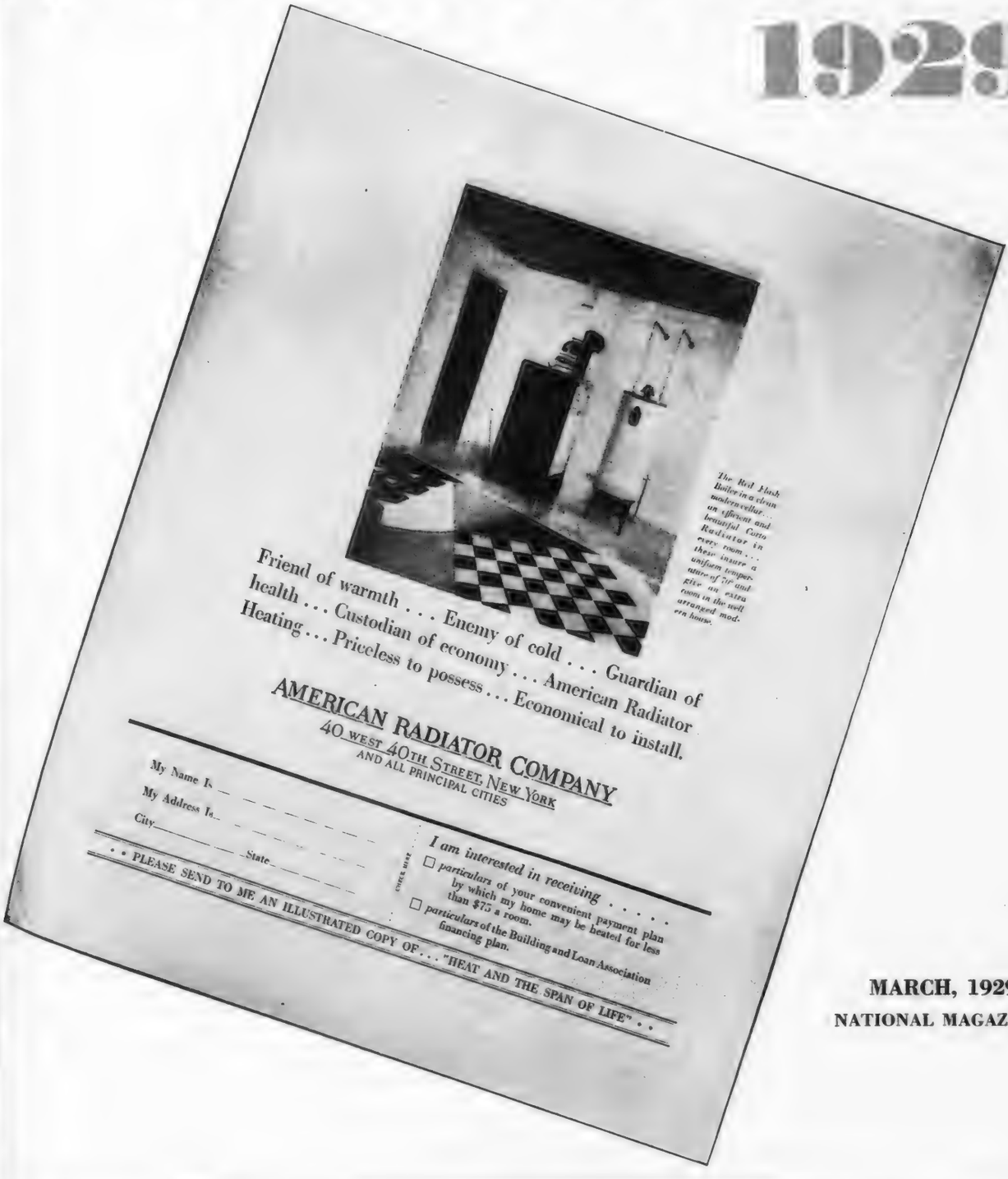
# AMERICAN RADIATOR

**40 WEST 40TH ST.**

***Branches***

# of Leadership

1929


The Red Flash Boiler in a clean modern cellar . . . an efficient and beautiful Corto Radiator in every room . . . these insure a uniform temperature of 70° and give an extra room in the well arranged modern house.
Friend of warmth . . . Enemy of cold . . . Guardian of health . . . Custodian of economy . . . American Radiator Heating . . . Priceless to possess . . . Economical to install.
AMERICAN RADIATOR COMPANY
40 WEST 40TH STREET, NEW YORK
AND ALL PRINCIPAL CITIES
My Name Is
My Address Is
City State
I am interested in receiving . . . . .
CHECK HERE
☐ particulars of your convenient payment plan by which my home may be heated for less than $75 a room.
☐ particulars of the Building and Loan Association financing plan.
. . PLEASE SEND TO ME AN ILLUSTRATED COPY OF . . . "HEAT AND THE SPAN OF LIFE" . .

MARCH, 1929
NATIONAL MAGAZINES

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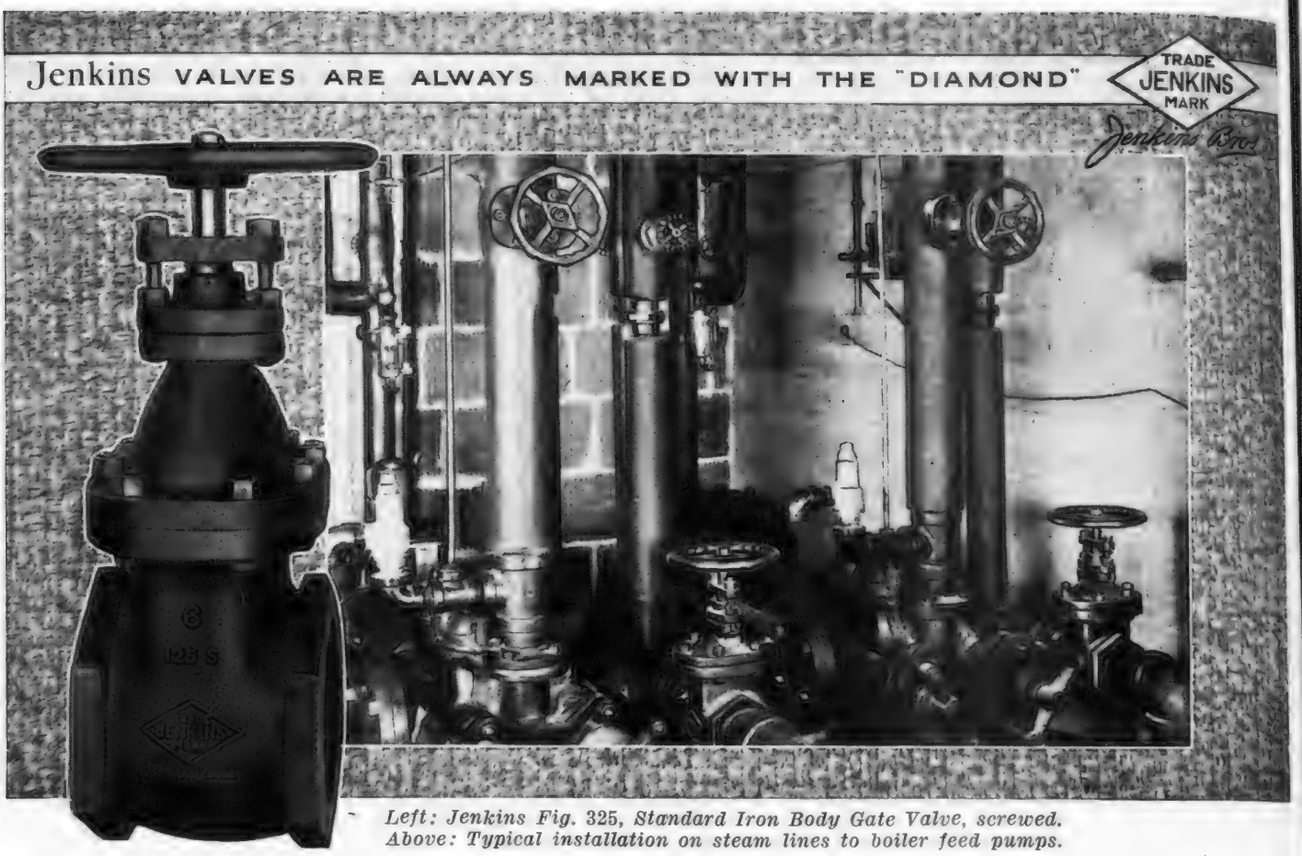
COMPANY
NEW YORK CITY
*Everywhere*




*Left: Jenkins Fig. 325, Standard Iron Body Gate Valve, screwed.*
*Above: Typical installation on steam lines to boiler feed pumps.*

# Keep good heating at its best

When a new heating installation is given the final "O.K.", its chances of remaining so depend much on the valves. To stay good, heating needs good valves.

Where the valves are Jenkins, heating is always kept at its best. The characteristic strength of Jenkins Valves assures unvarying dependable valve performance, unaffected by strains of pipe settling, lifting, expansion or contraction. Frequent handling does not interfere with the leak-tight seating of a Jenkins. Correct design, analyses-proved metals, and exacting care at each step of manufacture provide against every stress and strain of service.

There is a Jenkins Valve for practically every installation. Made in bronze and iron, in standard, medium and extra heavy. At all supply houses.

JENKINS BROS.

80 White Street, New York, N.Y. 133 No. Seventh Street, Philadelphia, Pa.
524 Atlantic Avenue, Boston, Mass. 646 Washington Boulevard, Chicago, Ill.
JENKINS BROS., Limited, Montreal, Canada; London, England
Factories, Bridgeport, Conn., Elizabeth, N.J.; Montreal, Canada

# Jenkins
## VALVES
Since 1864

# MARSH RE-ENFORCED PACKLESS, FLAT DISC LINE, complete in ALL PATTERNS and SIZES; *Angles, Globes, Corner* and *Back Offsets,* both PACKLESS and MODULATED types.

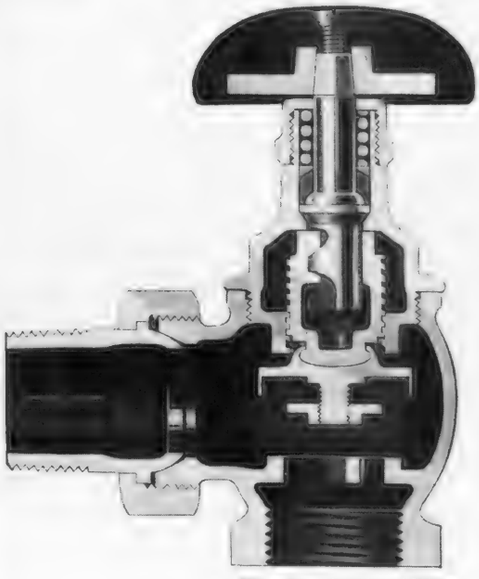


Fig. 133—Sectional View

Packless Fig. 133

In addition to the above FLAT DISC LINE, our CONE DISC LINE is ALSO COMPLETE IN ALL PATTERNS and SIZES, BOTH PACKLESS and MODULATED.

FURTHER: We furnish complete line of GLAND PACKED, rising stem valves, *Angles, Globes, Corner* and *Back Offsets,* all Sizes, BOTH in FLAT and CONE DISC Patterns. Also, *quick opening* and *upper seat* GATE Valves, *both with screwed ends* and *with unions, all sizes.* Line complete. Get our Catalog and Discount Sheet.

WE SPECIALIZE on HIGH GRADE radiator valves, THEREFORE QUALITY; and manufacture and furnish the largest and most complete line of any company in the world, THEREFORE QUANTITY at minimum cost; and—QUALITY and COST—are two important factors to consider in placing orders.

*EVERY VALVE IS FULLY GUARANTEED*

# MARSH VALVE COMPANY

**DUNKIRK** **NEW YORK**

***General Sale Distributors***

**Edward T. Hetherington**
**1709 Sansom St., Philadelphia**

**Appleton & Liptrott, Inc.**
**1480 Broadway, New York**

**John W. Mabbs**
**481 So. Dearborn St., Chicago, Ill.**

**United States Radiator Corp'n**
**General Offices: Detroit, Mich.**

**SARCO COMPANY, Inc.**
**183 Madison Ave., New York**

**Taylor-Forbes Company**
**Canadian Agents Guelph, Ont.**

N. W. Ayer Building in Philadelphia, heated with 570 ROBRAS 20-20 Radiators. Wm. M. Anderson, Heating Contractor.

# *Thank YOU* Mr. Anderson!

W. M. ANDERSON
STEAM FITTING, PLUMBING
500-512 SCHUYLKILL AVE.
PHILADELPHIA

May 7, 1929.

Rome Brass Radiator Corp.
1 East 42nd St.
New York, N.Y. Mr. James D. Erskine.

Dear Sir:

This will acknowledge yours of May 6th in which you enclose copy of advertisement of Rome Brass radiation showing the offices and the exterior front of the N.W.Ayer Bldg.

With reference to this installation which has been in operation for one full winter, we have not had one complaint. The N.W. Ayer Co. apparently are very well satisfied with this installation. In fact, I know that they have spoken of it very highly to clients of theirs who were considering new building plans.

Trusting everything is going well with you,

Very truly yours,

WMA*FK

W M Anderson

THAT Mr. Anderson should recommend ROBRAS 20-20 Radiators for the important N. W. Ayer Building in Philadelphia, was, in itself, an advance guarantee that they would prove satisfactory.

When the N. W. Ayer Company owner began to speak highly of these radiators and recommend them to their clients, Mr. Anderson wasn't surprised.

Mr. Anderson knows the heating game. He knew that the five hundred and seventy ROBRAS 20-20 Radiators used in this building were *bound* to prove satisfactory.

They were under-the-windows, in-the-wall, out-of-sight and out-of-the-way. They were correctly designed to heat satisfactorily. They were *the* great step forward in heating accomplishment. These ROBRAS 20-20 Radiators are 20% the size and 20% the weight of equal cast iron radiation. That means easy and quick installation.

Let us send you data sheets, price lists and printed matter. Your name, please!

## ROME BRASS RADIATOR
CORPORATION

ONE EAST FORTY-SECOND STREET :-: :-: NEW YORK CITY

# Get Ready for the Greatest Conversion Season in History

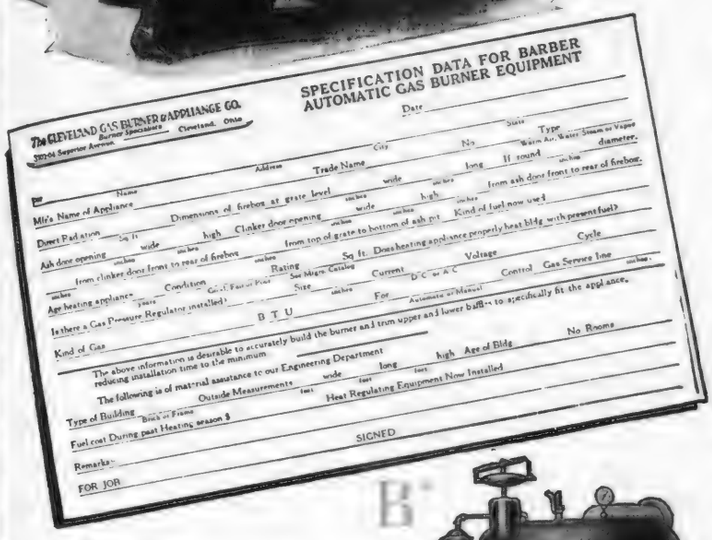
## The BARBER "Tailor-Made" Plan Furnishes You with Complete Automatic Assemblies All Ready to Install Quickly

THIS season should witness the greatest gas conversion sales ever known to the industry. The public today recognizes the superiority of automatic gas heating systems—the *Barber-Automatic Burner* is accepted as the outstanding leader in the gas industry for converting coal-fired furnaces and boilers to gas.

And heating and ventilating contractors, who appreciate the simplification of their merchandising problems, welcome the new Barber "Tailor-Made" plan which enables the installer to equip the appliance with a Barber Automatic Burner Equipment—made to the exact measurements of the furnace or boiler, so as to effect absolute efficiency and economy in operation.

***Write for our new A-29 Catalog and Trade Discounts***

**The CLEVELAND GAS BURNER & APPLIANCE CO.**
*Burner Specialists*
**3102-04 Superior Avenue. Cleveland, Ohio**



SPECIFICATION DATA FOR BARBER AUTOMATIC GAS BURNER EQUIPMENT

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio

Date _____

To _____ Name _____ Address _____ Trade Name _____ City _____ No. _____ State _____

Mfr's Name of Appliance _____ Type _____ Warm Air, Water, Steam or Vapor

Dimensions of firebox at grade level _____ inches wide _____ inches long _____ If round _____ inches diameter.

Direct Radiation _____ Sq. ft. _____ inches wide _____ inches high Clinker door opening _____ inches wide _____ inches high _____ from ash door front to rear of firebox.

Ash door opening _____ inches wide _____ inches high _____ from top of grate to bottom of ash pit Kind of fuel now used

_____ from clinker door front to rear of firebox _____ inches Rating _____ Sq. ft. Does heating appliance properly heat bldg. with present fuel?

Age heating appliance _____ years Condition _____ Coal Feed or Stoker _____ See Mfgrs. Catalog _____ Size _____ inches Current _____ For _____ D.C. or A.C. Voltage _____ Control _____ Cycle _____ Gas Service line _____ inches.

Is there a Gas Pressure Regulator installed? _____ Automatic or Manual

Kind of Gas _____ B. T. U. _____ The above information is desirable to accurately build the burner and trim upper and lower baffle to specifically fit the appliance, reducing installation time to the minimum.

The following is of material assistance to our Engineering Department

Type of Building _____ Brick or Frame Outside Measurements _____ feet _____ inches wide _____ feet _____ inches long _____ high Age of Bldg. _____ No. Rooms _____

Fuel cost During past Heating season $ _____ Heat Regulating Equipment Now Installed _____

Remarks: _____

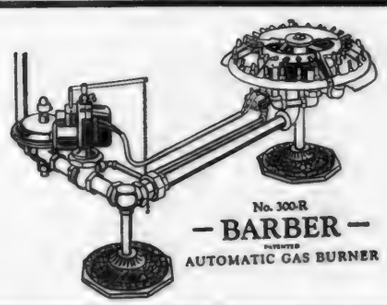
SIGNED _____

FOR JOB _____

A Simply supply the measurements of the furnace or boiler and other information requested on the Specification Data Sheet.

B The Specification Data Sheet is filled out by the Salesman and sent to the factory for a "Tailor-Made" job, which is shipped complete ready to be installed.

C The Barber Automatic — "Tailor-Made" — is then installed with the least time and labor.



No. 300-R
— BARBER —
PATENTED
AUTOMATIC GAS BURNER

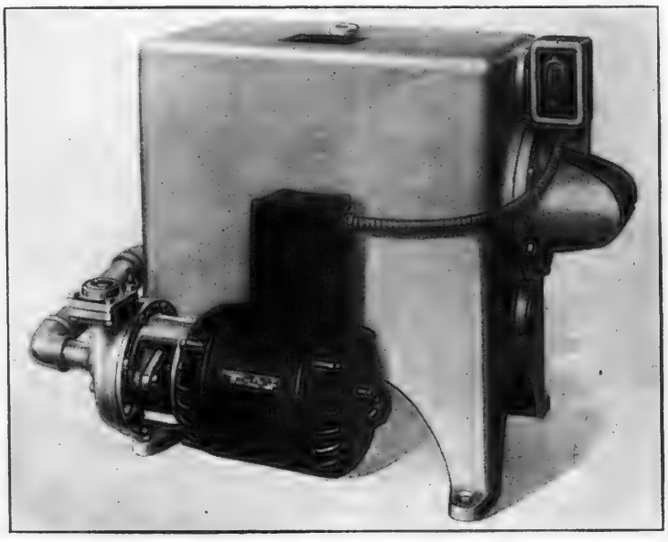
***A few available territories open for direct factory representatives, specializing in gas heating field.***

# BARBER *Automatic* JET GAS BURNERS

# TRANE CONDENSATE RETURN UNITS ARE COMPLETE IN EVERY DETAIL

You get a compactly arranged unit designed for the explicit purpose of collecting condensate and returning it to the boiler effectively and economically. The unit consists of a condensate receiver, motor driven centrifugal pump and the necessary controls providing dependable and complete automatic operation, including overload and low voltage motor protection. The Trane Unit is assembled and wired at the factory ready for installation on delivery. It is only necessary to connect it into the system and hook it up to the power lines. Contractors save from $10.00 to $20.00 on electricians fees alone. Trane Condensate Units are available for both A. C. and D. C. operation.

The economy of these units is amazing. It has been achieved by balance in engineering design and construction of each part. The small size unit with a capacity equivalent to 4000 sq. ft. of radiation occupies a total floor space of 20″ x 30″. The six gallon receiver keeps the number of starts and stops to a minimum. The pump capacity is sufficient to discharge the receiver once every minute against pressure ranging from 10 to 125 pounds. Power costs on the small units are $2 to $4 a month less than on ordinary installations. Savings are greater in proportion to the size of the unit.



## *Trane Unit Heaters*

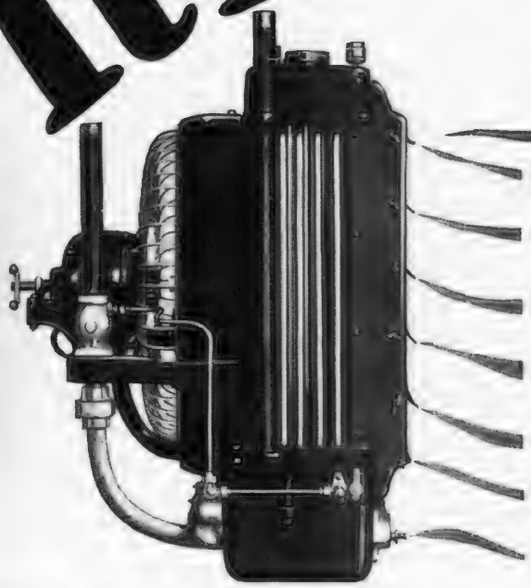
Trane's high standards of quality, and the progressive Trane policy, have been responsible for the most valuable developments in unit heater construction. Trane Unit Heaters now offer a 40% to 50% increase in capacity at practically no increase in cost. You can buy a Trane quality unit on a price basis—without the sacrifice of a single feature for which Trane Unit Heaters have won such enviable recognition.

It will pay you to investigate Trane equipment for any part of a heating system before making a recommendation or a purchase.

THE TRANE CO. (Dept. 6)
206 Cameron Ave. La Crosse, Wis.
*In Canada:* The Trane Co. of Canada, Ltd., Toronto, 2, Ontario

HEAT CABINETS **TRANE** CONCEALED HEATERS
PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

# It burns Gas!



HUMPHREY Industrial Unit Heaters are self-contained gas burning units, automatically and individually controlled . . . abundant heat, without fuel waste, at a moment's notice! No dirt no expensive central heating plant to require labor and storage space for fuel. Easy to install. Put them anywhere—suspended from the ceiling. Ideal for kilns, as well as for open factory rooms. Let us send you our new illustrated catalogue. It will open your eyes to a truly modern method of industrial heating.

**Flexible Heat for Industrial Uses**

*As Much Heat as You Want*

*Where and When You Want It*

# The Humphrey

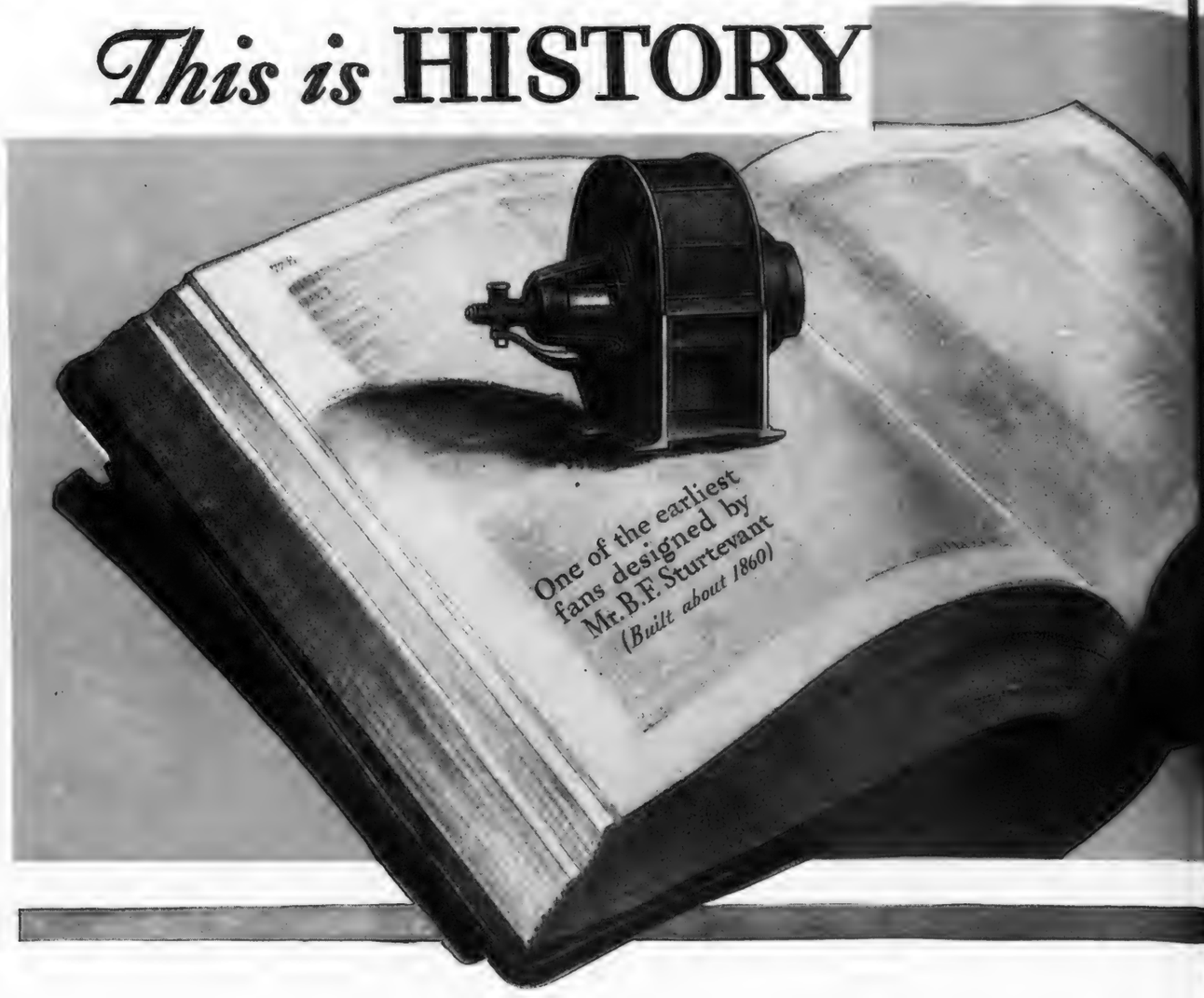
## *Industrial Unit Heater*

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN

New York, 44 W. Broadway

San Francisco. 135 Bluxome St.

# *This is* HISTORY




## . . . from five men to two thousand . . . from one floor to twenty-three acres

*The First*
*B. F. Sturtevant*
*Plant*

It is only a step back to the time when ventilating science was considered a fad. Fans and blowers had never been thought of. Most of the alloy steels of high tensile strength used in their manufacture were then unknown. Magnesium, vanadium, tungsten and manganese were laboratory curiosities.

When Mr. Sturtevant built his first blower there was little demand for his apparatus!

But recognition of inventive genuis came surely and quickly. One of the earliest orders Mr. Sturtevant received was for a blower for the United States Capitol. That's History!

**Sturtevant**

Reg. U. S. Pat. Off.

# *This is* NEWS

hey say that an institution is the lengthened shadow of one man. This e know—that the power and personality of Mr. Sturtevant is still with . "A lap or two in the lead" is still the motto.

. Sturtevant has just delivered the most powerful induced draft fan er built. That's News!

urtevant built the fans for the Holland Vehicular Tunnel under the udson River . . . for the George A. Posey Tube, connecting Alameda d Oakland, California . . . for the new Detroit-Canada Tunnel . . . r the New York Life Building.

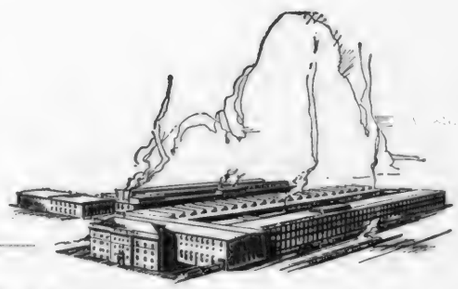
nd so it goes. History is the background. But *today's* success depends n today's ability to build apparatus that will win in the competitive arkets of this very exacting age.

will be a pleasure to send literature covering the latest types of urtevant ventilating equipment. Address our nearest branch office.

Sturtevant

F. STURTEVANT COMPANY, Hyde Park, Boston, Mass.

*anch Offices in Principal Cities; Canadian Offices at:* Toronto, Montreal and Galt.
*nadian Representative*: Kipp Kelly Ltd., Winnipeg—Also Agents in Principal Foreign Countries



*The B. F. Sturtevant Works, at Hyde Park, Boston, Mass., one of the Sturtevant Plants*

EATING-VENTILATING AND
OWER PLANT EQUIPMENT

ILLINOIS HEATING SYSTEMS

1900 1929

# ILLINOIS *Heating Systems*

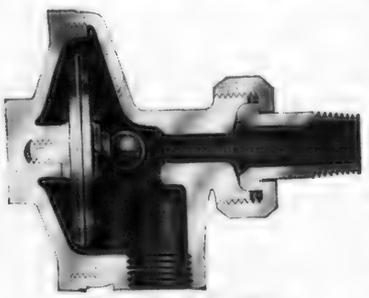
**As pioneers in the field of heating at less than atmospheric pressure—at vacuum vapor pressures, ILLINOIS Heating Systems have long been standard equipment in high class buildings of every type where the most exacting heating requirements are to be met; where noiseless operation, easy control of room temperatures, quick and positive steam circulation and fuel economy are demanded.**

**Many of the improvements in general use today were introduced and developed by the ILLINOIS Engineering Co.**

ILLINOIS Systems are balanced systems. All valves and specialties are of ILLINOIS manufacture and designed to operate as a unit. This offers great advantages over assembled systems made up of specialties of various manufacture and design, and gives centralized responsibility and guarantees.

## ILLINOIS Thermo Radiator Trap

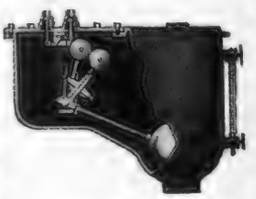
This is the Original Vertical seat trap, brought out in 1911. It is the oldest radiator trap now on the market without change. The diaphragms manufactured for the first traps are interchangeable with those made today. This trap is permanently adjusted at the factory and is self - cleaning. The *vertical* seat avoids trouble by stoppage from dirt. It is sensitive and accurate in operation because the diaphragm closes against the steam, not in it. It will withstand 100 pounds steam pressure — a real test.



Thermo Radiator Trap

## The ILLINOIS Return Trap

Brought out in 1915. The ILLINOIS Engineering Company was the first to furnish a return trap and a non-return air venting device as standard parts of a vapor heating system. This Original Return Trap, or alternating receiver, embodies the features of self-contained mechanism. No external working parts to be tampered with or injured—no stuffing boxes or packed joints insures continuous, satisfactory operation. It automatically returns the condensate to the boiler, regardless of boiler pressure.



Illinois Return Trap

## ILLINOIS Heat Retainor

The ILLINOIS Heat Retainor (Browne Patent), a non-return air venting device, has been a standard part of ILLINOIS Vapor Systems for many years. It is the *only* device of *any* description which combines successfully vacuum circulation,

Heat Retainor

ILLINOIS
HEATING SYSTEMS
1900 1929

or steam circulation, below atmospheric pressures, with all the advantages of an open atmospheric vapor system.

This perfect, sealed air vent permits the free escape of air from the system on ¼ ounce pressure, but is absolutely sealed against outside atmosphere. Air is water-washed before reaching the valve, which is in the top of the tank.

Zone Heat Control Valve

A recent example of the latest achievement of this company is the development of ILLINOIS Zone Heat Control, which consists of the use of Hornung thermostatically controlled and distant operated valves installed in branch mains supplying different heating requirements. These valves operate to shut off the steam when the zone operated by the valve is at the required temperature. This prevents overheating and results in a decided fuel economy. These valves are operated by a thermostat set in zone supplied by the valve.

The fuel economy effected by ILLINOIS Systems over other systems, which require actual steam pressure to heat the building, will conservatively run from 20% to 33-1/3%. This, in addition to refinements in operation not equalled by other methods of steam heating, is why ILLINOIS Systems enjoy a remarkable record for repeat orders among discriminating owners, architects, engineers and builders.

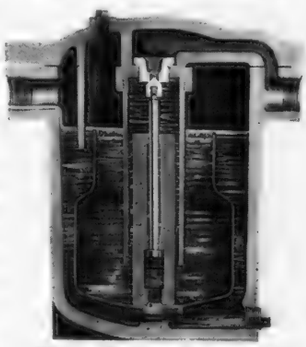
Reducing Valve

In addition to special vacuum and vapor heating appliances, we manufacture a complete line of specialties for the automatic control of steam. This enables us to use the proper device to secure results under widely varying conditions.

ILLINOIS Eclipse Steam Specialties are one of the oldest and best known lines on the market, among which are included Drip Traps, Strainers, Steam Traps, Pressure Reducing Valves, of the various types for all conditions of service, Steam and Oil Separators and Non-Return Valves.

Back Pressure Valve

Nearly all of the ILLINOIS Steam Specialties embody original and exclusive features of design or principle. An interesting example is the Eclipse Steam Trap. It has a valve which is either wide open or tight closed, and *never* in an intermediate position or cracked on the seat. This prevents wire drawing and makes the action of the valve snappy and positive. These traps are built for all pressures from 600 lbs. to 1 lb., the high pressure traps of nickel steel bodies and Monel parts. These traps also have a special air venting feature, which does away with the necessity for the usual pet cock. The low pressure blast trap is largely used to drain blast stacks, dry kiln coils and other large units.



Illinois Eclipse Steam Trap

This company has a most modern valve factory equipped with up-to-the-minute labor-saving machinery. They operate their own brass and bronze foundry, so that most of their products, from raw material to finished product, are built under one roof.

Every valve and steam specialty is carefully tested under steam, vacuum, and hydrostatic pressure before shipment, the test being under the pressures at which they are to operate in service. The advice of a staff of experienced engineers is available at all times on questions of type, capacities and proper installation of ILLINOIS products.

# ILLINOIS ENGINEERING COMPANY

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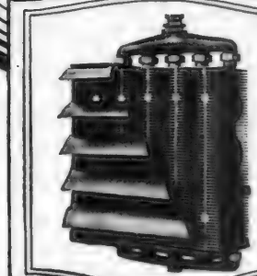

# Specify permanence—

WHEN you specify Thermal Units you specify *permanent* heating efficiency. This, because the vulnerable point of ordinary unit heaters has been made strongest point of the Thermal Unit.

Consider the *security* of installing a unit heater in which the heating section is tested to 400 pounds pressure—a unit heater in which the heating section has no joints, welds or soldered connections—a heater with a heating section that is immune to corrosion.

In laboratory tests the Thermal Unit is surpassed by no other unit heater. But never forget that the laboratory tells only part of the story. It is in the greater laboratory of actual application that the durability of the Thermal Unit means *maintained* efficiency—efficiency that can be translated into fuel and dollars saved.

Let us show you how, why and where the Thermal Unit "outlasts them all."

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HEATERS
PATENT PENDING

APPROVED BY INVESTIGATING COMMITTEES
OF ARCHITECTS AND ENGINEERS

# Low Water Line Control

**an important feature of the Skidmore Interceptor-base Vacuum Pump is carried out in the new Skidmore Condensation Pump, now being introduced to the trade. Pitting of pumps is often eliminated with the design of pumps shown.**

Illustration of Skidmore Condensation Pump Assembled

THE Skidmore Condensation Pump is furnished in all sizes with cast iron receivers of large water capacity, the motor being supported on a rigid cast iron volute bolted to the end of the receiver. A float switch is mounted on top of receiver and connected to motor with flexible conduit.

The centrifugal impeller is of bronze enclosed type and is locked on the end of the shaft against a bronze sleeve which extends through the stuffing box over the extended shaft of the motor, which is of ball bearing type, of ample capacity and standard make.

Illustration of Skidmore Condensation Pump Showing Ease of Accessibility Without Disturbing Piping

The Skidmore Vacuum Pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

Illustration of a Skidmore Automatic Vacuum Pump

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This means compactness in design and minimum floor space occupied.

The automatic starter, together with vacuum regulator and float switch, are mounted on this unit. All wiring is installed at the factory.

*In writing for further information request: Bulletin No. 6 for Skidmore Vacuum Pumps, Bulletin No. 7 for Skidmore Condensation Pumps.*

## SKIDMORE CORPORATION

*General Offices and Factory:* 1535 Dayton St., Chicago, U. S. A.

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# Without Attention—Without Fuel

***and the fire burned for 5 days!***

THE whole thing was an accident, not a test, although it occurred in the Engineering Laboratory of R. V. Frost, Norristown, Pa.

¶A standard Richmond boiler was fired on a Monday morning with the idea of its being needed that day. The need not arising, the boiler was left alone until the following Friday, when a man in the laboratory discovered there was still live fire—and it lasted until Saturday night.

¶A remarkable, unexpected demonstration—that only a perfectly designed and constructed boiler could possibly give.

¶Learn more about Richmond Boilers—and why they always "make good." Send the coupon in the opposite corner for facts.

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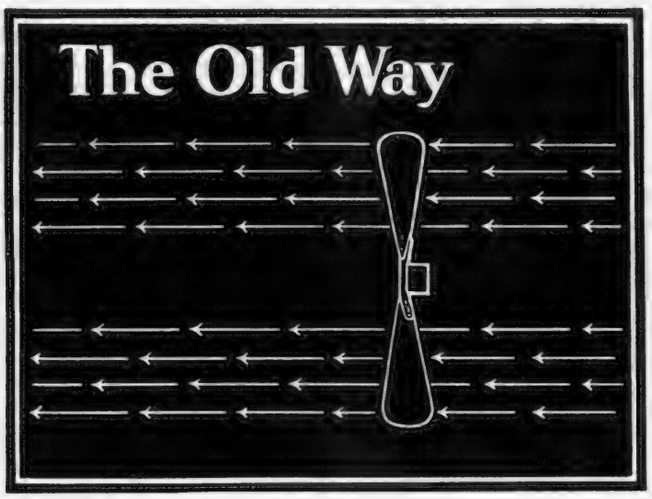
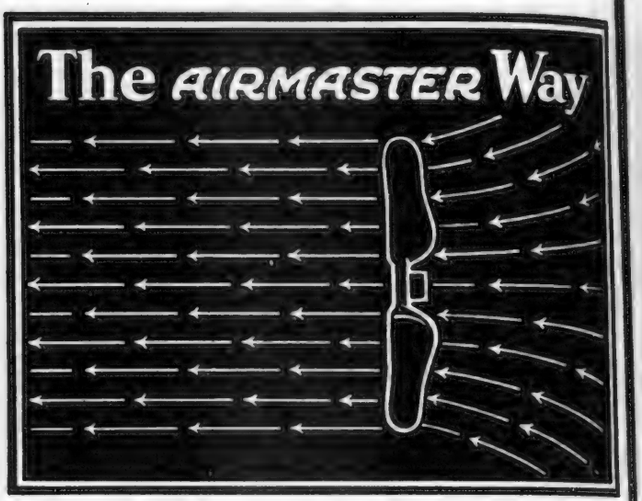
# LET'S LOOK AT BLUEPRINTS




## *for the answer to the dead-air-space* PROBLEM

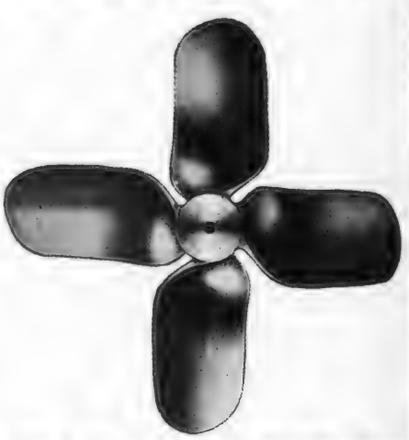
AIRMASTER overcame the dead-air-space problem—ventilating's stubborn obstacle to efficiency—by creating a solid shaft of air instead of the ordinary ring. Airmaster's "eagle wing" principle is nature's principle. Let's get to fundamentals:

Greater air thrust is obtained by cupping the propeller. Admittedly. Like the eagle's wing is cupped close to the body (power source), Airmaster cups its propeller *close to the motor*, instead of the conventional cupping near the tip. It was the obvious thing to do. It requires less effort, less power.

Airmaster moves more air with less effort because the air thrust is practically equally distributed. The blueprint tells the story. Airmaster's shorter blades* have less vibrating resonance; its design reduces air friction and resistance. Result: larger air capacity, less power consumption, silent operation. What more could you want of any ventilating fan?

Learn fully about Airmaster's applications and opportunities for you. Use the coupon below for full particulars. It's worth your while.

*Airmaster propellers are fully protected by patents.



AIRMASTER

Reg. U. S. Pat. Off.

Note the hump on the blade*—there's the secret of Airmaster's greater volume of air delivery. Airmaster exhaust fans with 16″ or 18″ Airmaster propellers will assure the same efficiency as an 18″ or 20″ propeller of the ordinary type.

**AIRMASTER CORPORATION, 140 South Dearborn Street, CHICAGO**

Send complete information about Airmaster propellers and exhaust fans, without obligation to me.

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# Every Man Faced With Automatic Control Problems Should Have This Book

Do you want a practical man's text book that is chock full of sound information on automatic control problems—that not only clearly describes and illustrates every type of control and regulator but in addition gives blue prints—tables—charts—diagrams—on practical installations?

25 years of practical experience have been put into this book. All the skill and experience of our engineering department is at your command in its pages. And this same skill has made McAlear Products widely used in the largest industrials, schools, hotels, public buildings, etc. Leading consultants, architects, engineers specify McAlear because they recognize the mechanical refinements and improvements that these 25 years have built into our products. McAlear Products come to you correctly engineered, extremely simple in design, sturdy, dependable and with high efficiency ratings.

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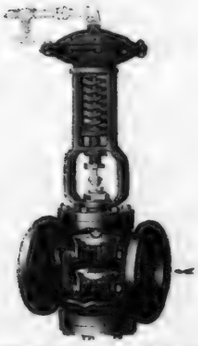
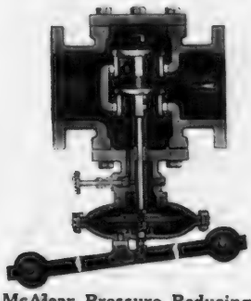
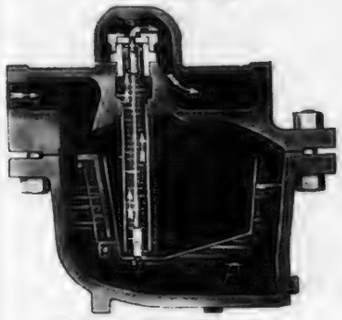


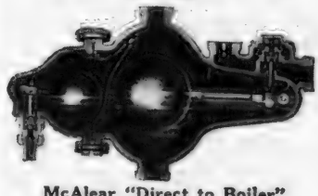
McAlear Pressure Reducing Valve No. 235



McAlear Pressure Reducing Valve No. 195



McAlear Open Float Trap No. 685



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# MILESTONES by ADSCO

ROLL back the years to 1904, the year of the Louisiana Purchase Exposition—the year of early automotive and wireless progress—that was the year Heating and Ventilating made its debut. Look at the first issue of that publication—and on its cover you will find an American District Steam Company advertisement.

*Go back still farther*—back to 1877—and there you find the origin of the American District Steam Company, and all that it represents.

The trail of ADSCO from that day to this is marked with many outstanding contributions to the progress of steam heating and steam heating's greatest triumph —the great District Heating projects of today.

ADSCO equipment is used on practically every great District Heating installation in the country. It is recognized as being unexcelled for any kind of pipe line service.

ADSCO Milestones are more than merely significant records of advancement—they are an historical outline of the progress of steam heating as a whole.

AMERICAN DISTRICT STEAM COMPANY
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1927 CELEBRATED 50 YEARS HEATING AND PIPING WORK.

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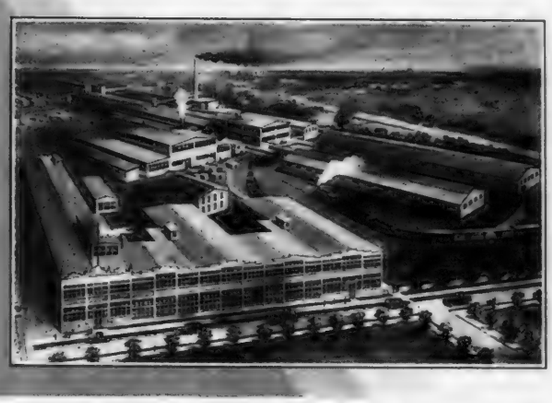
CREATED ENGINEERS' SERVICE DEPARTMENT TO ASSIST ENGINEERS ON DISTRICT HEATING AND PIPING PROBLEMS



FIFTY YEARS IN BUSINESS

# *Hundreds of* ADSCO EXPANSIONS JOINTS *installed 25 years ago still giving perfect service.*

And when "Heating & Ventilating" celebrates its Golden Anniversary, hundreds of ADSCO Expansion Joints installed in 1904 will *still* be giving perfect service.

NOT so many months ago, a steam line was dug up for replacement after nearly thirty years of continuous operation. The ADSCO Expansion Joints were found to be in excellent condition and have since been installed on another line by their users. That's service!

Throughout the country are *thousands* of ADSCO Expansion Joints that have been underground for ten to twenty-five years without attention. From past experience there is every reason to expect that they will be giving faultless service when they are a half century old. ADSCO Joints are built that way!

Use ADSCO Expansion Joints when you want your installation to be above criticism—not alone for months or a year, but for years into the future.

You can get ADSCO Joints in exactly the size and style to meet the requirements of the job. The thousands of combinations in which they can be obtained—with or without anchorage, service connections and drain outlet—enable you to cut down installation time and costs and at the same time insure maximum efficiency from the line.

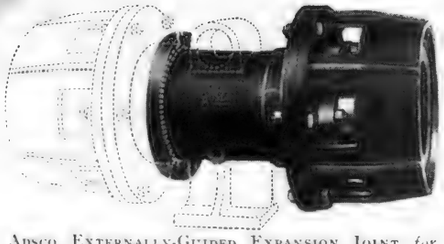
ADSCO Expansion Joints come to you with the enthusiastic endorsement of the country's leading Heating Engineers, who know from experience that no finer expansion joints are built today.

*Write for complete literature and prices.*

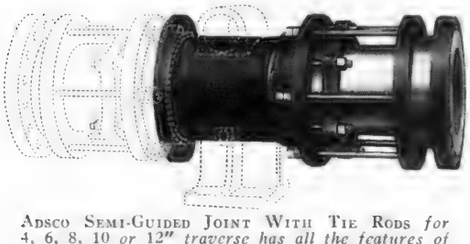
**AMERICAN DISTRICT STEAM COMPANY**

GENERAL OFFICES AND WORKS

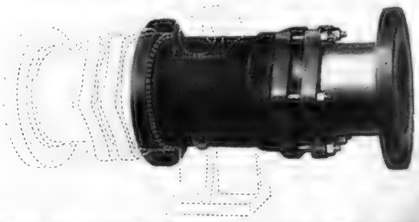
NORTH TONAWANDA, N.Y.



ADSCO EXTERNALLY-GUIDED EXPANSION JOINT *for 4, 6, 8, 10 or 12" traverse, 125 to 250 lbs. pressure. Checks distortion. Assures correct alignment of the slip. Provides a secure anchorage and a service outlet.*



ADSCO SEMI-GUIDED JOINT WITH TIE RODS *for 4, 6, 8, 10 or 12" traverse has all the features of semi-guided joint plus protection provided by tie rods against slip pulling out of body.*



ADSCO SEMI-GUIDED EXPANSION JOINT *for 4, 6, 8, 10 or 12" traverse, 125 and 250 lbs. pressure. Extensively used in high and low pressure lines where external guide is not required.*

ADSCO DUPLEX-SLEEVE GUIDED EXPANSION JOINT *for pressure up to 500 lbs. and temperature to 750 degrees F. Air-cooled slip eliminates excessive packing and maintenance costs and assures a tight joint. Standard traverse 8". Can also be furnished with 4" or 12" traverse.*

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***makes a complete line of Equipment for the economical distribution of steam - - - -***

- Expansion Joints
- Angle Fittings
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- Special Flanged Fittings
- Variators (Packingless Expansion Joints)
- Steam Pipe Casing
- Adsco "Nelson" Gate Valves
- Steam Traps
- Reducing Valves
- Condensation Meters
- Steam Flow Meters
- Packless Graduated Radiator Valves
- Thermostatic Radiator Traps

FIFTY YEARS IN BUSINESS

# HEATING AND VENTILATING

*formerly*

The Heating and Ventilating Magazine

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**VOL. 26** **NO. 6**

### *Our New Name*

WE appear this month under our new name, HEATING AND VENTILATING. To most of our readers THE HEATING AND VENTILATING MAGAZINE has familiarly been known by its shorter title. So when the suggestion came that we make the change, it seemed quite the natural thing to do.

Already we feel as if we had taken on new life. We no longer think of ourselves as a magazine, a repository of facts and figures, but as something a good deal more than that. Under the stimulus of our shorter and more expressive title the weight of the years represented by our quarter-century of life drops from our shoulders and we step out with renewed energy and enthusiasm to meet the New Day in the industry.

A. S. Armagnac

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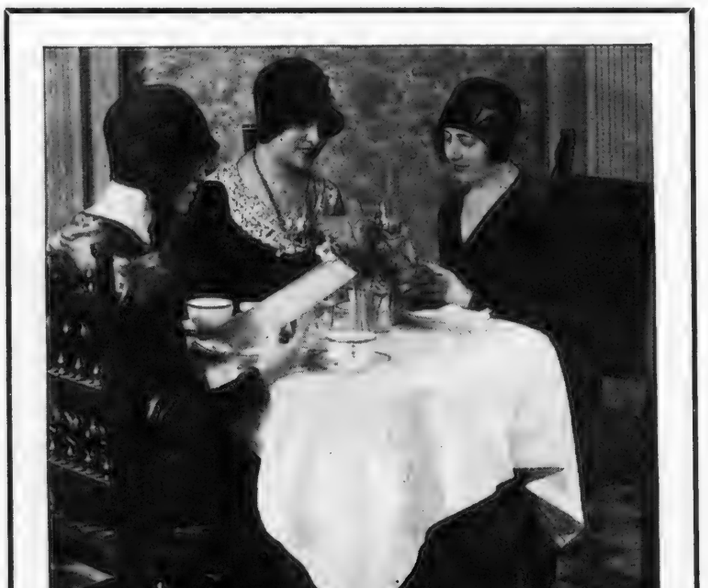
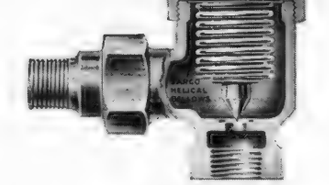


# *The* Invisible Patronage Attraction



"OH, yes, Bob and I always stop at the Victoria. The food and service are perfect. But what appeals to us, after having knocked around the world so much, is that the rooms are always so warm and comfortable and we have never had that most annoying experience of no hot water, just when a bath is wanted.

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# HEATING AND VENTILATING

## *Editorial*

IT has been a strenuous, but delightful, experience to have compiled this June Silver Anniversary Issue. It has had its poignant moments, too. Among other things, the undertaking involved a review of the back volumes, bringing back faces and associations which are gone forever. We saw in fancy the kindly faces of Professor Carpenter and William J. Baldwin and felt the dynamic personality of Professor Kent and the warm fellowship of Dean Allen. But most of the work was taken up with correspondence and interviews with the men who have been making heating and ventilating history these twenty-five years, and what a history it is! Although it is true that many of the early leaders have passed on, it also is a fact that the men who led the second advance, so to speak, from the introduction of vacuum and vapor heating and air conditioning to the development of the unit heater, the unit ventilator and light-weight non-ferrous heating surface, still are as active as ever and, therefore, are to be numbered with the present generation.

To that extent, this issue is unique in containing the stories of the pioneers themselves, and it is safe to say their accounts will live as part of the history of the art.

A world of credit is due them for their help in enabling us to present such a complete record of the industry's activities during the past quarter-century. It would take too much space to enumerate them all and, indeed, they would be the last to desire or expect such recognition. They have the satisfaction of knowing that they have made valuable contributions to the history of the art which only they themselves could supply.

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IN reviewing the progress during the past quarter-century the thing that stands out in bold relief, in the light of the present state of the art, is the labored attempts that were made to achieve simple results. Take, for instance, the evolution of the direct radiator. It took us years to learn that the simplest and plainest forms were the best, but in the interval how weird and wonderful were the styles which marked the vogue of the ornamental column radiator. Another example is the steel-plate "paddle-wheel" fan. When the multiblade fan first made its appearance it seemed more like a toy than a serious contender of its big, clumsy-looking prototype. Then, when light-weight indirect radiation had established itself, it was hard to believe that a given unit could duplicate the output of a pipe coil three or four times its size.

---

AND yet it is not for the present generation to set itself upon a pedestal. When our Fifth Anniversary Number was published, in 1909, we recall with what pride we sent it forth with its typical advertisements and illustrations of that period. Then, in 1915, our Tenth Anniversary Number seemed indeed to be the last word, so great had been the industry's progress. Now, in 1929, the equipment and appliances on the market bear what looks like the stamp of finality, while the products of even five years ago are *passée.*

It is rash to predict, but we wonder what the next generation of heating products will be like. Already significant reports are reaching us of the activities of important electrical interests in the field of house-heating. Room-cooling units are an accomplished fact. Panel heating is about to have its *premiere* in this country through the installation of such a system in the British Embassy buildings in Washington. Oil and gas interests are straining every nerve, from the standpoints both of cost and service, to improve the status of these fuels. In the coal field a close approach to automatic operation has been obtained by elevating the coal bin and installing automatic stokers.

It may seem incredible that our grandchildren will pick up this Silver Anniversary Issue and chuckle over the state of the art as it existed in 1929, but is not that what we must expect? The answer, we fear, is yes, and that leads us to the thought that we set out to express when we started to pen these notes. Pick out the most finished product to be found in this issue and then look forward in imagination to our Golden Anniversary Issue and the presentation therein of a corresponding unit. It is a safe wager that the later development, by comparison, will make the present product look crude. Think, then, what it means when we realize that, far as we have progressed, a world of achievement lies ahead.

To a technical journal like HEATING AND VENTILATING, the prospect is fascinating. So far from feeling that the pioneering work is accomplished, we expect to be more than busy keeping pace with the march of events, and if the magazine has played any part in shaping the evolution to date it will expect to be fully as active in keeping its readers abreast of the changes which are sure to come as the heating and ventilating industry goes forward towards its destiny.

# Twenty-Five Years of Progress—A Review

*by* **PROF. JAMES D. HOFFMAN**

*Head of Department of Practical Mechanics, Purdue University*

James D. Hoffman and His Son, Jimmy

WHILE steam and water heating have undergone many changes during the past quarter-century, gravity hot water (atmospheric and medium pressure), low-pressure steam (one- and two-pipe), gravity vacuum (the Paul system), mechanical vacuum (the Webster system), district steam (live and exhaust), district hot water (forced, one- and two-pipe), fan coil, and split systems (direct and indirect) were all in evidence at the beginning of that period. What a flood of recollections centers around the personalities who represented these systems!

Progress in steam and hot water work is evidenced in the development of modifications of systems and in the refinement of parts of old systems. Specifically, hot water systems have changed very little. Considerable work has been done on the determination of friction in pipe lines and bends, thanks to Professor Giesecke and others; and also in the line of high-temperature, high-velocity gravity circulation. In forced systems, reciprocating pumps have given way to centrifugal pumps, and economizers are used as heaters, along with the exhaust from turbines. The practice of using exhaust steam from engines and pumps, where oil inclusion is a factor, has been abandoned. This about tells the story.

In steam systems, pressures are higher in pipe-line distance transmission, while heating pressures are lower. Former high pressures of 10 to 50 lbs. now are 50 to 200 lbs. This avoids extreme sizes in transmission pipes; and in low-pressure heating 1 to 5 lbs. on the system have dropped to atmosphere and far below.

On small jobs, operated by gravity, the greatest thought has been exerted in an endeavor to provide continuous steam circulation and modulated temperatures. Plain low-pressure steam systems, unless fired frequently, are intermittent—all on or all off—and are very unsatisfactory for residence heating.

As a result, a large number of small and medium-sized, atmospheric and vapor systems, with various methods of regulating the amount of steam entering the radiator and of holding a partial vacuum within the mains when the steam pressure falls to atmosphere and below, have been devised. In these systems the regulation may be hand-controlled or automatic at the radiator inlet, and is always automatic at the return end.

Some of these automatic valves are thermostatically- and some mechanically-controlled. Valves answering this description are many and new ones are coming out like "The Philistine"—every once in a while.

Twenty-five years ago, we probably were endeavoring to make a great reputation and got into the habit of thinking of large jobs—schools, auditoriums, shops, etc.—and apparently forgot the home. We since have come to realize that the home is a most vital and valuable point of contact and we seem now to be trying to make up for lost time.

In residence heating we are finding out that one of the most difficult conditions to be met is the giving of anything like continuous service without frequent firing. Here is where the hot-water and warm-air systems have had the advantage. These two systems were more adaptable to the moderate weather of spring and fall, and to a more continuous circulation of heat in severe weather.

It was necessary, therefore, that some means be employed on the steam systems such that the average householder could moderate his steam temperature when necessary and could carry the circulation throughout longer periods of time without personal attention, if steam were to compete with hot water and warm air on the basis of convenience to the operator. The vacuum principle gave promise of successfully being applied and the results have been quite favorable.

Most of the larger steam systems are operated as mechanical vacuum plants. In these, where attendants are on duty all or most of the time, intermittent service is not a problem. The mechanical vacuum principle is not new, but recent adaptations of this principle to permit close regulation of temperatures not only are new, but simple and scientific.

### Vacuum in Returns Was Common Thirty Years Ago in Large Systems

For example, the larger plants of the early 1900's had pressures approaching atmospheric within the radiators and a partial vacuum within the return, the vacuum being produced by a pump, and the regulation being accomplished by a thermostatic member between the pump and the radiator. In general this principle still maintains, with possibly a more reduced pressure within the radiators and returns.

In addition, thermostatic control now is applied to the principal main and, if the plant is sufficiently large to justify it, thermostatic or orifice controls also are applied to some of the principal branch mains and the radiators of the system.

One of the most recent control measures to be applied is that of dividing the system into zones, and operating these zones independently of each other. This feature seems to be earning large dividends wherever applied; furthermore, its application is so simple that one might wonder why it was not thought of before.

It is not my desire to call attention to any specific system or its peculiar fitness to accomplish the objectives sought. Suffice it to say that mechanical vacuum regulation, as now installed, will operate satisfactorily on varying radiator pressures, ranging between 5 lbs. pressure and 20 in. of vacuum. This range will accommodate any pressure-temperature conditions that may be desired.

Speaking of radical departures, there has been a real revolution in radiation. The old vertical pipe coil, with a cast base, gave way years ago to the heavy oval-column cast-iron section. More recently, there has come into the field a new tubular model of lighter form, and a still lighter extended-surface model. These two types will probably compete with each other for some time. The determination as to which is to survive will be decided by adaptability, durability and weight.

Methods of housing and connecting up radiators also are changing. One would not think of attributing excessive modesty to any thing of this kind, but it is a fact that radiation is attempting to hide away in the most inaccessible places and then is demanding tests to prove that it will do as much work in the dark as when exposed to the light of day. If it does it will prove itself more than human. In point of appearance this plan seems to appeal to the public.

As a further change, copper and rustless materials rapidly are replacing ferrous metals for such service. While more expensive per square foot of surface, there is less surface needed because of the higher conductivity values. The radiator has been one of the continuous subjects of investigation and research, and the problem is not yet completely solved.

One of the favorite topics for study (previously mentioned) has been the best method of modulating the radiator output to meet the different heat demands from the room. Most radiators now are top connected, and of the water type.

This permits modulation in either one of two ways: (1) with a motor valve or thermostatic valve on the return end of the radiator and with the modulating inlet valve or diaphragm adjusted so as to use low pressure or atmospheric steam on only as much of the upper horizontal zone of the radiator as is necessary to heat the room, the lower part of the radiator being comparatively cooler; (2) with a thermostatic valve on the return end of the radiator, a modulating valve or diaphragm at the inlet, a partial vacuum on the return line and a lesser vacuum throughout the radiator, in which case all sections of the radiator are at approximately the same temperature.

In either of these two cases the radiator may be operating full time at a minimum rate, rather than at full rate for a minimum time. This improvement tends toward economy of steam consumption.

Temperature control in the larger mechanical vacuum systems has received unusual attention. Large numbers of these systems now are operating radiators on each of the vacuum plans just named and show large savings over the ordinary low-pressure steam plan. The saving is accounted for by the fact that there is an even balance between the radiator heat supplied to the room and the room demands, thus avoiding the necessity of frequent opening and closing of windows.

In these systems the radiator control is assisted by main steam line control, operated by a thermostat from outside the building or from some important point within the building, and frequently assisted, in addition, by thermostatic control on the principal steam branches.

The latest improvement in this type of heating is by zoning the building and operating each zone as an independent unit. By this means, regulation on the sun side and the shade side of the building may more easily be met than if regulation is attempted as one large unit. Also, it permits certain parts of the building which are to have similar and possibly intermittent service to be segregated and closed off independently of the rest of the heating system. It permits separating the heating system into zones on different levels, thus unifying operating pressures throughout each zone more satisfactorily. Mechanical vacuum heating certainly has been greatly refined in the past quarter of a century.

### Early District Heating Plants Equipped with Cheap Conduit

In the district heating field, the earlier plants, hot-water plants especially, were installed with cheap grades of conduit insulation which, during the time of the life of the insulation, brought dividends to the heating companies.

As soon as these insulations began to give way there was no amortization fund for replacement, and replacements of run-down sections of conduit caused such a financial strain upon the operating companies that the plants were looked upon as a financial burden.

In addition, the practice of using

exhaust steam from engines directly into the heating system, soon coated the inside of radiators and pipes with a sludge which served as an insulator and effectively cut down heat transmission, thus making the individual heating systems too small for the heat demands of the house. Unfortunately, this sludge is very difficult to remove and whole residence plants have been removed for new and clean radiation.

It is an easy step from here to a wholesale dissatisfaction with the whole district heating business. So great had this become, about the time of the World War, that entire plants were offered as gifts to any person or persons who would assume the responsibility of their operation and would guarantee results. This was a condition to be met and not a theory, and the condition should not have been charged against district heating, but against the way in which district heating had been carried on.

Conditions now are coming back more nearly to what they should be. Power plants are using turbines and oil is not a difficulty to be overcome. Also, the value of conduit insulation is more apparent and underground lines are being installed for economy and not just to get them under ground. The economic value of the district heating plant in connection with power-generating plants cannot be questioned, especially where the exhaust steam may be used for heating purposes.

## Gravity Warm-Air Heating

In all phases of the science of heating there probably has been no greater scientific development than in the *warm-air furnace system.* This system followed the old-fashioned heating stove and was one of the earliest methods of heating residences. Simple in application and modest in price, the warm-air furnace had a strong appeal and a large opportunity, but for a considerable period of time its reputation for reliability waned.

Furnace manufacturers themselves were uninformed concerning the type of design which would give best results, and, consequently, were working more or less in the dark. Furnaces were being sold to unreliable parties who installed them without proper scientific guidance and, failing to give satisfaction (as was true of large numbers of installations), the purchasers became "bears" instead of "boosters" for the system.

This condition persisted for some time and things had gone from bad to worse until the year 1918, when the National Warm-Air Heating and Ventilating Association (an association of furnace manufacturers) established a warm-air furnace laboratory testing plant in cooperation with the University of Illinois.

This plant tested furnaces and apparatus, and collected data for several years, and the results were so convincing that the same society built a three-story frame residence at the same institution, especially designed to check the results obtained from the laboratory testing plant. This residence plant was dedicated December 3.

From these two plants, data were obtained which served as the basis for the Standard Furnace Code, a set of rules and regulations for the installation of warm-air furnace systems in residences.

Thereafter, conditions in the line of warm-air furnace heating began to improve, and I think it is not out of place to say that the scientific data collected from these testing plants, compiled and distributed as a code of minimum requirements, have improved the design and selection of the apparatus, and the installation of the same to a remarkable degree.

*Facts, not guesses,* are what the people want and this educational propaganda seems to be revolutionizing the warm-air furnace industry. The Standard Furnace Code, just mentioned, is the means through which this information reaches the public.

The Sixth Edition of the Code is just off the press and to date over one-half million copies have been distributed, with the result that public confidence in this line of heating is being restored and one now may be assured that a system installed in accordance with the Code will give satisfactory service.

Again, we have a concrete illustration of the effect of cooperation among men who are determined to dig down to bed rock to get the fundamental facts upon which their industry rests. Such facts are convincing but they can be obtained only by paying the price of earnest and careful investigation, and the National Warm-Air Heating and Ventilating Association (now the National Warm-Air Heating Association) is to be congratulated upon its foresight and achievement.

## Mechanical Warm-Air Heating

The application of mechanical power to warm-air heating systems has been in vogue for many years. Two quite distinct principles have been involved: (1) blowing air over metal surfaces heated by direct contact with the products of combustion; (2) blowing air over metal surfaces heated by steam or hot water.

Number (1), commonly known as the fan-blast system, was applied chiefly to installations of moderate size, such as schools and auditoriums. In most parts of the country this system is not now enjoying the popularity it once had.

In small jobs, however, such as warm-air furnace heating in residences, garages, etc., the forced circulation of the air by fans promises to develop into a real demand. When applied to a gravity warm-air job, this would be known as a booster fan, all parts of the system being designed for gravity circulation during all but the coldest weather. When designed as a blower system, with correspondingly smaller ducts, the fan is supposed to operate at all times when heat is required.

One objection which has been urged against fan-blast systems is the over-heating of the circulating air in contact with high temperature plates. In the smaller systems this objection need not seriously apply.

Number (2), the fan-coil system, on the other hand, has continued with increasing popularity in all lines of medium-to-large heating service. Steam is universally the heating medium and almost any of the systems of temperature control and regulation may be applied.

In the fan-coil system of development no great surprises are found, but distinct progress is evident.

Heating surfaces have changed largely from pipe-coil to non-ferrous coils and cast sections. These seem to be more durable.

For many years air washers and humidifiers were combined with the heating units, but more recently air filters have been competing seriously with the air washers. The latest type of air filter is a sectional affair that is easily cleaned and adjusted.

Systems for heating only, for ventilating only and for both heating and ventilating have been arranged. Fans of different characteristics have been designed for use with different types of systems, and methods of humidification and purification have been studied and applied in many ways.

Mechanical warm-air systems in general have recently had to meet certain adverse propaganda advocating the open-air principle and specifically condemning the mechanical warm-air systems in schools and auditoriums, but these have as yet lost little prestige because of it. Further investigations, possibly of a more scientific and fundamental nature, will be required before any valid objections will be recognized against this type of heating.

One tendency that is very noticeable in all combination steam and forced-air systems is toward the division of these systems into independent units. In many buildings basement room space is not provided for a system of warm-air ducts, and it is more convenient to pipe the steam to the point selected for the warm-air entrance to the room and install a small fan-coil unit at this place.

## Oil, Gas and Electric Heating

The problems of the heating engineer in any locality have been influenced by the fuel situation. At the beginning of our quarter-century some sections were blessed beyond measure with natural gas; consequently, this was the only fuel used and it was used lavishly. Economy was not considered. In districts where natural gas went out, a flood of temporary systems came in and these sections just now are recovering from the effects.

Coal still is the standard fuel of the country and is running ahead of all others; coke is preferred by a few; oil is moving up at a lively rate; artificial gas is off to a good start, and electricity is trying to qualify. The last three entries—oil, gas and electricity—are prime favorites for those who can pay the somewhat higher costs of these fuels.

Much research and experimentation have been expended in the development of oil and gas-burning apparatus. This has resulted in combustion plants whose operation is automatic and safe, and whose regulation is effective. Ordinarily, electricity would not be considered in residence heating, but a few houses recently have been connected with power plants where water is heated during the night time on off-peak hours, and this water used as a circulating medium during the day. These plants are reported as working effectively, and it is claimed that electricity thus can be sold at a rate which will make such systems attractive to many users.

In oil, gas and electric residence heating (especially gas and electric), one important factor must be taken into consideration — the building. This houses the heating system and should be well insulated and well constructed. When walls are well insulated and attic spaces are properly insulated from room spaces, heat losses may be reduced to such a degree that fuels which now are considered luxuries may become commonplace.

## Ventilation and Air Conditioning

I mention the word "ventilation" with some hesitation; 'tis a strong man, or reckless, who will attempt to pass judgment on this subject at this time. In 1904 we "ventilated" our room interiors by diluting the room air with a certain percentage of outdoor air, and felt we were getting somewhere. The practice in many cases still persists in fact, but is thought to be behind the times in theory.

Now, we are advised to "condition the air" by recirculating it, screening out or washing away suspended matter, and renewing the vitality of the air by regulating temperature, humidity and movement.

In the early days we talked of carbon-dioxide and "crowd poisons" given off by respiration; now, it is said, if there are any such animals they are harmless. Why worry about the kind of air you take into your lungs, as long as you give the air a comfortable temperature, properly moisten it and keep it moving.

For a number of years, temperature, humidity and air movement have reigned supreme—but not quite —ozone claimed the center of the stage part of the time. Our good friend and engineer, the late Edwin S. Hallett, who but a few weeks ago was taken from us, accomplished some very unusual results in the Saint Louis schools by purifying air with ozone.

But with all of these theories and practices our air problem seems to be still unsolved. Being a subject of such universal interest, research and investigations continually are being carried on. No theory seems to hold for long, but undoubtedly each development brings us nearer the goal.

## Ionization May Help Solve Many Problems of Ventilation

The latest theory on this subject concerns the "ionization" of the air. This was very ably discussed in a paper before the Illinois Chapter of the A.S.H. & V.E., in January, 1929, and again reviewed by the author, Frank E. Hartman, in *The Aerologist* for March, 1929. Mr. Hartman suggests "ionization as the air soluble vitamin." Here is a new line of thought that may well cause the heating and ventilating engineers to "sit up and take notice." May I express the humble opinion of the writer of this article that we seem to be knocking at the door of a storehouse thus far not considered, and that this storehouse may contain revelations of great value to the heating and ventilating engineers of the country.

The encouraging sign in all this uncertainty is the fact that nothing is taken for granted. No experiment is too complicated and no labor is too exacting in this quest for a solution. The exact formula expressing the real vitalizing influence of the air on the human body, in my opinion, has not yet been written, and when it is written it may be very complicated. Here's hoping that we will recognize it when we see it and be able to apply it to the average living conditions.

A. S. Armagnac,
Editor
Since 1905

# Our Twenty-Fifth Anniversary

*by* **A. S. ARMAGNAC**

WHEN THE HEATING AND VENTILATING MAGAZINE began publication, in June, 1904, Theodore Roosevelt was president of the United States, the day's news turned on the activities of "malefactors of great wealth" and Labor was making Rome howl with its demands for shorter hours and increased pay. In the heating trade, steamfitters in the large centers were refusing to work for less than $27.00 for a 48-hour week.

Henry L. Hall, of the New York Steam Fitting Company, was president of the National Association of Master Steam and Hot Water Fitters (now Heating and Piping Contractors National Association), and Andrew Harvey, of A. Harvey & Sons Mfg. Co., of Detroit, was president of the American Society of Heating and Ventilating Engineers.

I well remember the debut of THE HEATING AND VENTILATING MAGAZINE. It was at Atlantic City, where the N.A.M.S. & H.W.F. was meeting that year. Little did I imagine at the time that seven months later I was to begin a quarter-century's career as editor of the new journal and that I was to see the time when it would become an important factor in the industry.

H. A. Smith, who then was editor and publisher, distributed the first copies himself. The magazine was a little 7-in. by 10-in. proposition, with perhaps 20 pages of advertising and 28 pages of text. It seemed a weakling indeed beside those well-established and successful journals, the *Metal Worker*, of which Frank K. Chew was editor; *Engineering Review*, whose editor was Joseph Graham, and *Domestic Engineering*, then edited by John K. Allen.

Some idea of the state of the art at that time may be gained from the fact that air washers were unknown, the multiblade fan was yet to be born, ozone had not been heard of as an adjunct to ventilation, and vapor heating was in the experimental stage. The big "paddle wheel" fans, as they were called, were in universal use for blast work, while the "blast" heaters themselves were in the form of pipe coils. Cast-iron blast heaters did not appear on the scene until 1908, while lightweight non-ferrous heaters, one might say, are a development of yesterday.

The talk of the day centered around vacuum heating and the tribute, in the form of royalties, that was being collected by the vacuum heating patentees, for what many in the industry characterized as "God's blue air." Be that as it may, money in a constant stream was pouring into the coffers of the vacuum heating

THE HEATING AND VENTILATING MAGAZINE

Vol. 1 NEW YORK, JUNE, 1904 No. 1

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All WIDE-AWAKE ENGINEERS Use KIELEY Steam Specialties

KIELEY & MUELLER, 24 W. 12th St., New York City, N. Y.

**This Cover Page of Vol. 1, No. 1, Measured 7 In. x 10 In. and Was Printed on Blue Stock to Heighten the Effect**

interests for the privilege of installing a Paul or Webster system. And the practice continued without abatement until the basic vacuum heating patents expired a few years later.

In spite of what, in the light of later events, might be called the crude state of the art, there is evidence that the industry had some vision of the future before it.

# 1904 ▼ 1929

**Gustave Petersen, Business Manager Since 1908**

**The Cover for April, 1918, when the Magazine Devoted Almost Its Entire Advertising Section to the Third Liberty Loan Campaign**

Men of the caliber of C. B. J. Snyder, at that time architect and superintendent of buildings of the New York City Department of Education; William M. Mackay, then secretary of the A.S.H. & V.E.; Prof. R. C. Carpenter, of Cornell; Warren Webster, of Warren Webster & Co.; Prof. J. H. Kinealy, of St. Louis, Clarence V. Kellogg, of the firm then known as the Kellogg-Mackay-Cameron Co., of Chicago; Elias D. Smith, vice-president of Baker, Smith & Co., of New York; Henry L. Hall, president of New York Steam Fitting Company—to name but a few of them—caught the vision and joined the band of original stockholders of THE HEATING AND VENTILATING MAGAZINE COMPANY.

A perusal of the first few issues furnishes interesting evidence that the proponents of "natural" or window ventilation were active as early as 1906. Even then, almost as much editorial attention was being paid to "open-window" arguments as to the vacuum heating situation. Compulsory ventilation became the slogan of the A.S.H. & V.E. and it was not long before half a dozen states had followed the lead of Massachusetts in requiring "30 cu. ft. of fresh outdoor air per minute per person."

At that interesting juncture, the air washer, so-called, made its appearance, and the industry began to realize that, with means for removing dirt and other impurities, it now was possible to recirculate air in school and other buildings without deleterious effects.

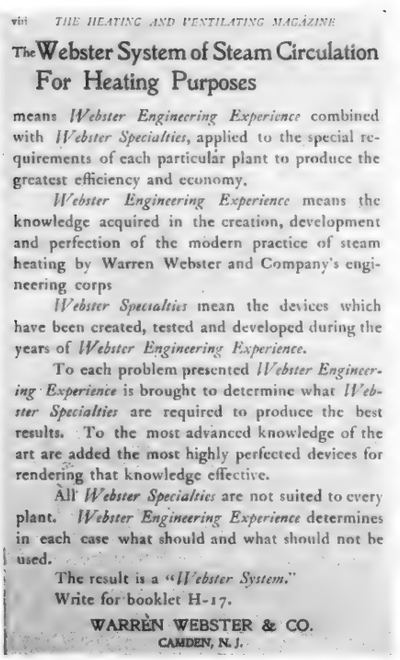
Then came the bombshell at the 1911 annual meeting of the A.S.H. & V.E., when Dr. Luther Gulick, who was in charge of the Department of Child Hygiene of the Russell Sage Foundation, presented data proving the fallacy of the $CO_2$ test as the sole criterion of the purity of the air. THE HEATING AND VENTILATING MAGAZINE, in its issue following the convention, published details of the test data on this subject for it was realized even then that the experiments had inaugurated a new epoch in ventilating practice.

By that time the magazine had passed into the hands of A. S. Armagnac and Gustave Petersen, editor and business manager, respectively, where it was to remain for the next 20 years. The magazine had made some progress in a business way, because in 1909, when it celebrated its fifth anniversary, it boasted of 20½ pages of advertising and 49½ pages of text.

But many were the shoals that lay between it and the success toward which it was striving, and many are the stories that could be told of the magazine's vicissitudes during that critical period.

The writer recalls his early enthusiasm as he dropped in one day on the late Alfred R. Wolff, then the leading factor in the heating and ventilating engineering field in this country, to procure plans, for publication, of the Elizabeth, N. J., courthouse installation.

"Mr. Wolff," I said, "it is my ambition to make THE HEATING AND VENTILATING MAGAZINE as large as the *Engineering Magazine*" (at that


viii THE HEATING AND VENTILATING MAGAZINE

**The Webster System of Steam Circulation For Heating Purposes**

means *Webster Engineering Experience* combined with *Webster Specialties*, applied to the special requirements of each particular plant to produce the greatest efficiency and economy.

*Webster Engineering Experience* means the knowledge acquired in the creation, development and perfection of the modern practice of steam heating by Warren Webster and Company's engineering corps

*Webster Specialties* mean the devices which have been created, tested and developed during the years of *Webster Engineering Experience*.

To each problem presented *Webster Engineering Experience* is brought to determine what *Webster Specialties* are required to produce the best results. To the most advanced knowledge of the art are added the most highly perfected devices for rendering that knowledge effective.

All *Webster Specialties* are not suited to every plant. *Webster Engineering Experience* determines in each case what should and what should not be used.

The result is a "*Webster System*."

Write for booklet H-17.

WARREN WEBSTER & CO.
CAMDEN, N. J.

**This and the Other Two Advertisements Here Reproduced Appeared in the First Issue of the Magazine**

time an imposing journal and dominant in its field).

"You have a pretty big undertaking ahead of you, young man," was Mr. Wolff's reply, and a smile broke over his face as he added, "You'll have to hustle to do that."

Years later, in 1925, to be exact, this dream was fulfilled. Our only regret is that Mr. Wolff himself, who always was a warm friend of the magazine, was not alive to witness the pride we felt in the achievement.

In those days the loss of a few pages of advertising was enough to jeopardize the life of the magazine. Imagine the writer's sentiments, therefore, when, as he was about to "make up" an early issue, one of the magazine's advertisers came into the office. The visitor was George D. Hoffman, whose subsequent success as president of the Hoffman Specialty Company is one of the outstanding epics of the industry. At that time he had launched his own business as the inventor and manufacturer of the Norwall valve.

He took from his pocket copy for an advertisement which he laid on the editorial desk with the remark: "I want you to insert that in your next issue." "Thank you, Mr. Hoffman," I said, "I will have the printer make this change."

"Change, nothing," exclaimed Mr. Hoffman, "this is an extra advertisement I am giving you."

If the chandelier had rained gold, the effect could not have been more startling and for the balance of the day I trod on air.

There is a sequel to that story, which might better be told by Mr. Hoffman himself, but at the risk of his displeasure, I shall tell it.

"Mr. Armagnac," he said, years later, "do you remember when I came into your office in the early days of the magazine and gave you that double order for advertising?" "Very well," I replied. "And do you remember," he continued, "that I told you you would have to extend credit to me for payment of the account?" "I do." "Well," he said, "I have never forgotten it and from that day to this THE HEATING AND VENTILATING MAGAZINE has always been included in my advertising schedule."

Another incident during the struggling years was connected with the publication of an article on the threading of steel pipe. A few days later a long-distance call from the National Tube Company asked for a quotation on 3000 extra copies of the issue, complete. "Did you say three thousand?" I asked, thinking I could not have heard aright. "Yes, three thousand," came the response. "Oh, very well, just a minute," I said as feverishly I made the estimate.

Well, the order came through and it marked another red-letter day in the progress of the magazine.

Many a time during that period, and subsequently, the publishers of THE HEATING AND VENTILATING MAGAZINE were advised and urged by their friends to expand its scope to take in plumbing and even electrical equipment. In October, 1913, we took occasion to say editorially:

"We trust we shall be pardoned for talking this month more particularly about ourselves. We take considerable pride in the fact that this issue of THE HEATING AND VENTILATING MAGAZINE enjoys the largest advertising patronage of any number we have published. While such an achievement always is a source of gratification as marking a further step in advance, in this case we feel it is a distinct tribute to the value of quality, as distinguished from quantity, circulation. It has long been our boast that the specialized trade journal, with its comprehensive circulation, is in a better position to serve both reader and advertiser alike than the more general trade paper.

"Since its establishment, THE HEATING AND VENTILATING MAGAZINE has followed the important policy of sticking to its own field. While such a policy always has its disadvantages in circumscribing a journal's activities, these are more than counterbalanced by the class of readers it attracts and the attention it is able to devote to that field. This was demonstrated in a convincing manner by several speakers at a recent trade press convention and is now given further confirmation in our own case by the success that is attending this policy."

In 1914, came our tenth anniversary. By that time the magazine had grown to 148 pages for its anniversary issue, while the regular issues averaged 86 pages.

At that time we said:

"A business career of ten years does not always mean much in these strenuous days, but when it comes to the development of a magazine, and especially one devoted to the engineering side of a profession, such a journal easily may acquire in that space of time a personality all its own, making it an object of interest, friendship and even loyalty on the part of those who have closely followed its fortunes.

"Such sentiments as these animate

THE HEATING AND VENTILATING MAGAZINE

*Old Friends Meet in a New Field*

*The outside appearance of Triton Radiators can easily be compared with other makes. If you will examine the inside of all makes you can deal more intelligently with the radiator question, please us, and find where we excel—in pattern making, core work, and molding, and will know why Triton Radiators are the most satisfactory to use.*

**United States Radiator Company**
*DUNKIRK, NEW YORK.*

Branches:
New York, 1519 Fuller Bldg.
Washington, The Albemarle.
Minneapolis, 432 Guaranty Bldg.

Warehouses:
Jersey City, N. J.
Minneapolis, Minn.

**When this Advertisement Appeared Ornamental Column Radiators Were the Vogue**

the publishers of THE HEATING AND VENTILATING MAGAZINE as they celebrate with this issue the magazine's Tenth Birthday Anniversary. Only those who have borne the heat and burden of the day can appreciate the extent to which the magazine's personality has impressed itself upon their minds and consciousness. To them it has become a living thing whose standards and ideals have taken form and may not be treated lightly or lowered. Its years of coddling and nurturing might well be compared to those of the small but sturdy youngster, albeit with the difference that its maturity has been reached in less than half the allotted time of youth.

"And now, as we stand on the higher reaches and look back, we live over again the magazine's early struggles.

"It was an enthusiastic and hopeful, yet daring, group of men, who made possible the founding of THE HEATING AND VENTILATING MAGAZINE and even yet, many of their names stand, as they did then, in the very forefront of their profession, while others have retired from the heating trade, and two of their number have passed on to the Great Beyond. This is the roll of the magazine's original stockholders:

*Wiltsie F. Wolfe, Fowler & Wolfe Mfg. Co., Philadelphia, Pa.
C. B. J. Snyder, Architect and Superintendent of Buildings, Department of Education, New York.
Henry L. Hall, New York Steam Fitting Co., New York.
†William M. Mackay, Mackay Mfg. Co., New York.
†Prof. R. C. Carpenter, Cornell University, Ithaca, N. Y.
†Harrie D. Crane, W. H. Crane Estate, Cincinnati, Ohio.
Francis A. Williams, Blake & Williams, New York.
Warren Webster, Warren Webster & Co., Camden, N. J.
*James F. Heg, Paul Steam System Co., Chicago, Ill.
†Prof. J. H. Kinealy, St. Louis, Mo.
†Clarence V. Kellogg, Kellogg-Mackay Co., Chicago, Ill.
B. H. Carpenter, B. G. Carpenter Co., Wilkes-Barre, Pa.
†Elias D. Smith, Baker, Smith & Co., New York.
†Alfred E. Kenrick, Kenrick Bros., Brookline, Mass.
Albert A. Cryer, Paul Steam System Co., New York.

* Deceased.
† Deceased since June, 1914.

THE HEATING AND VENTILATING MAGAZINE xxiii

**Hot All Over**

In most heaters the sections of the front half do less heating than those in the rear. In the

**Henderson Thermo**

the draft arrangement makes the front sections fully as effective as the rear ones. This is a distinct gain. Catalogue explains fully.

Twin Sections—Slip Nipples—No Bolts Through Water
Different Constructions for Water and Steam—Surface Blow-off

**The PRIZER-PAINTER STOVE & HEATER CO.**
**Reading, Pa.**

700,24 Ave., PITTSBURG
65 Lyman St., SPRINGFIELD, MASS.
370 Jackson St., ST. PAUL

New York Office and Showroom
160 18TH AVENUE
Jerome A. Goodrich, Manager

**This Advertisement Is Typical of the Days of Fancy Boiler Fronts**

A sidelight on the magazine's editorial policy is shown in a letter which came in one day in 1915, intimating that this policy was governed by business expediency. The reply was typical as representing the attitude of the publishers, not only then, but before and since. Our comment was:

"The point made by our correspondent regarding the bearing of the interests of the advertisers on the advertising policy of a journal is 'important, if true.' One of the striking advantages that may be possessed by the independent trade journal is its absolute freedom from such influences. Fortunately, this happy condition was one of our birthrights and was never so firmly cherished as at present."

It is worthy of note that, in 1915, THE HEATING AND VENTILATING MAGAZINE began the custom of publishing each year, usually in September, a smokeless combustion issue (later known as a Fuel Conservation Number) in which was featured, among other things, the development of smokeless boilers.

One article in particular entitled "The Trend Towards the Up-draft in Smokeless Boiler Construction" was sharply criticized by some of the down-draft boiler people.

A few years later, the writer was traveling to St. Louis in company with one of the men who had been most severe in his criticism of the article in question.

"By the way," he said, "what was that scrap about, that you and I had in connection with one of your smokeless combustion issues?" "Why, don't you remember," I said, "you criticized us for saying there was a trend towards up-draft combustion in smokeless boilers." "Did I," he exclaimed, with a chuckle, "well there was, all right."

In view of the fact that the heating contractors, in 1919, changed the name of their organization from the National Association of Master Steam and Hot Water Fitters to the Heating and Piping Contractors National Association, it is interesting to recall an editorial in THE HEATING AND VENTILATING MAGAZINE for July, 1916, which said:

"A proposal to change the name of the National Association of Master Steam and Hot Water Fitters deserves more than passing notice, not because it is likely to be adopted, but because it shows the trend in the development of this industry. As was stated in favor of the proposal, the general conception of a 'fitter' is of a man who screws up pipe, and the use of the old-fashioned 'master' in the title does not by any means convey an adequate meaning to the public. As was pointed out, the members of this association are not steamfitters or even master steamfitters. They are, at the least, heating contractors, and many of them can lay claim to even a higher title.

"Why, then, should the trade continue to do business under an outworn, misunderstood and clumsy title that does not properly represent its position or activities? Many heating contractors seldom see the jobs they have in hand and when visits are made to them, it is usually for the purpose of inspection and general supervision. These men fail to rise to the dignity of their calling when they are willing to pass, in the general estimation, as mere master fitters, when they rightfully can assume the position of experts and contractors for the heating equipment.

"Some such substitute as the 'National Association of Heating Contractors' is suggested. This is practically as comprehensive as the longer name and has a force that is

wholly lacking in the present title.

"The fact is that the heating trade, as well as the heating profession generally, has never fully risen up to its opportunities. It has been too long content to be a mere trade, rather than a distinct technical industry. Now, it would seem, is the opportunity to take a step forward in the interest of improving the status of the heating man, and while it would be a good thing to have the master steamfitters adopt the proposed title, it is even more important for the trade to begin to accustom itself to a more comprehensive designation."

Other items which assume significance in connection with the dates of their appearance in the magazine are:

Inauguration of the monthly weather charts for five representative American cities in 1906.

Inauguration of THE HEATING AND VENTILATING MAGAZINE'S standard data sheets in February, 1917.

An outstanding event occurred in January, 1918, when an arrangement was made with the Chicago Commission on Ventilation to publish the complete reports of the commission's work exclusively in THE HEATING AND VENTILATING MAGAZINE. These reports were reprinted in pamphlet form and constitute part of the history of the art.

## Unit Heaters Given Support by Magazine Since 1918

When the first modern unit heater was placed on the market, it was described and illustrated in THE HEATING AND VENTILATING MAGAZINE for January, 1918. In June of the following year, the leading article entitled "The Rise of the Unit Heater" was the first recognition to be given, in a responsible quarter, to this development. The article attracted no end of attention and brought forth a flood of letters to the effect that THE HEATING AND VENTILATING MAGAZINE might be engaged in some worthier activity than that of "stabbing" its friends among the fan manufacturers. As a result of the agitation we felt called upon to publish the following editorial, the significant feature of which is the date of its appearance in the issue for March, 1922:

"Less than a year ago, the point was advanced by one fan manufacturer that engineering papers were not adopting a proper attitude towards manufacturers of ventilating equipment by 'exploiting' the unit heater in comparison with the central fan system. Manufacturers of unit heaters and similar apparatus, it was maintained, are prone to characterize the central fan system as 'out-of-date and of worthless design.' This attitude seems to be an accompaniment frequently attending the development of any radical variation of accepted practice. In their zeal some of the unit heater advocates have drawn the deadly-parallel simile with scant regard, it must be admitted, for the sensibilities of the old-line fan manufacturers.

"But what has happened? Where, ten years ago, the types of unit heaters could be counted on the fingers of one hand, today we see them multiplied until all of the leading fan manufacturers are equipped to supply them on demand. Indeed, so significant has become the growth of unit heaters, especially those of the fan-blast type, as to constitute a distinct epoch in the industry. What it all means may not be clear at this time, but it is certainly a factor to be reckoned with and a journal which purports to represent the industry and fails to take cognizance of their existence could hardly escape the stigma of narrow-mindedness.

"Such being the case, a responsibility devolves upon the exploiters of the unit blast heaters, no less than upon the advocates of other methods, to meet the questions very properly raised as to the capabilities of their apparatus, the principles applied in their design and any other information that will lead to a correct appraisal of their usefulness. Let us look at all the facts, to the end that a correct judgment may be formed as to the place these appliances should occupy in the ventilating field."

A similar flood greeted THE HEATING AND VENTILATING MAGAZINE'S championing of the unit ventilator, which for years had been looked upon with disfavor by responsible interests in the industry.

Both in the case of the unit heater and the unit ventilator, the time came when the position of THE HEATING AND VENTILATING MAGAZINE was vindicated and today, of course, the use of both appliances is standard practice. I believe I am correct in saying that all of the old-line fan manufacturers now are manufacturing unit heaters.

By 1918, America had become involved in the World War. In April of that year, THE HEATING AND VENTILATING MAGAZINE published a war number which, in many ways, was a remarkable issue. Among other things, the issue contained a section of 16 pages of advertisements in connection with the Third Liberty Loan, the copy, in every case, being run by the advertiser in place of his regular advertisement. So impressive was this number that it received the official commendation of the Treasury Department.

When the so-called "dry" air filters made their appearance in 1923, they were first presented in THE HEATING AND VENTILATING MAGAZINE. Another notable date is November, 1923, when a leading article was devoted to "The Advent of the Copper Air Heater."

## A. P. H. A. Challenged Ventilating Engineers

In May, 1923, THE HEATING AND VENTILATING MAGAZINE displayed in a prominent manner under the caption "The Challenge to Modern Heating and Ventilation," the resolution which had been adopted at the annual convention of the American Public Health Association condemning mechanical ventilation and coming out in favor of window ventilation.

Many friends of the magazine felt that a mistake had been made in giving such publicity to the action of the A.P.H.A. However, in the light of later events, the magazine's action was effective in sounding an alarm which woke up the industry to the dangers that were imminent in the propaganda of the "open-window" advocates.

In 1926, THE HEATING AND VENTILATING MAGAZINE entered into an arrangement with the Heating and Piping Contractors National Association to publish its Standard Radiation Estimating Sheets, which form a part of the association's Engineering Standards. The series of double-

page tables ran for more than a year in the magazine as data sheets and proved of inestimable value to heating contractors everywhere, besides winning wide recognition of the association and of the work of its Standardization Committee.

Outstanding among the more recent achievements of the magazine is the part it has played in the recognition and development of domestic oil burning. Sensing the importance of this development the magazine, in 1924, issued a manual on the subject, made up of articles and data which had appeared in its columns. This manual, under the title of "House Heating With Oil Fuel," ran into three editions, the last two editions being under the authorship of P. E. Fansler, at that time associate editor of the magazine.

Later, as a result of the extravagant and often misleading statements appearing in the publicity matter of the oil-burner manufacturers, the magazine took a stand in favor of more accurate descriptions of the technique of oil burning and of the operation of oil burners. Under the title of "Loose Sales Talk" the magazine backed up its arguments by presenting concrete examples taken from manufacturers' catalogs. Within a year or less the situation had practically been corrected and much of the credit for the improved state of affairs was given to THE HEATING AND VENTILATING MAGAZINE.

A more recent service in the general engineering field was the compilation by the magazine of degree-day data for some 2500 cities and towns in the United States and the publication of the "Iso-Degree-Day," chart and "Iso-Coal," "Iso-Gas" and "Iso-Oil" consumption charts based on the degree-day which makes it possible to find the heating load in any part of the country, whether coal, gas or oil is the fuel used.

In November, 1928, THE HEATING AND VENTILATING MAGAZINE was acquired by National Trade Journals, Inc., New York, and now forms one of a group of business periodicals known as National Building Publications, Division of National Trade Journals, Inc. Other publications in the group are: *Architectural Forum, Building Age, Good Furniture and Decoration,* and *Home Builders Catalog.*

Under the new arrangement the position of THE HEATING AND VENTILATING MAGAZINE has been strengthened immeasurably and its opportunities for service to its readers increased accordingly.

Both in its editorial policy and its administration the magazine continues along the same lines which have brought it to its present place as an authoritative spokesman of the industry it represents. At the same time, it has the added strength of the powerful group with which it is associated, making it possible for the magazine to carry out many projects in the line of reader service and an enlarged editorial program.

Only a few of the high spots have been touched upon in the foregoing sketch of THE HEATING AND VENTILATING MAGAZINE'S career. Many thoughtful men believe that the next quarter-century will show far greater progress in the art of heating and ventilation than has been witnessed to date. There is every reason to concur in this view, and it opens up a prospect of fascinating interest, as well as of immense importance from a commercial standpoint.

AS THE HEATING AND VENTILATING MAGAZINE completes, this year, its first quarter-century of publication, we look forward eagerly to another 25 years of service in which the activities and needs of all branches of the industry will continue to receive their full share of attention and support.

## Reminiscences of an "Old Timer"

***by* James McAlear**

TWENTY-FIVE years is a long while for us "Old Timers" to remember all the progressive developments in heating and ventilating systems and kindred equipment that have taken place during that period. Before I became a manufacturer of steam specialties I was consulting engineer, and prior to that I was sales engineer for a large blower company and a vacuum heating specialty company. These connections have kept me in touch with all the developments and improvements that have taken place in the last quarter of a century.

Developments and improvements made in steam boilers for heating and low-pressure service have been very noticeable. In fact, the type of boiler used twenty-five years ago has practically been discarded and its place filled by boilers designed to be quick steamers, fuel and labor-savers. The newer type steam boiler with magazine feed requires refueling but once in 24 hrs. The mechanical stoker for low-pressure heating boilers also is producing excellent results.

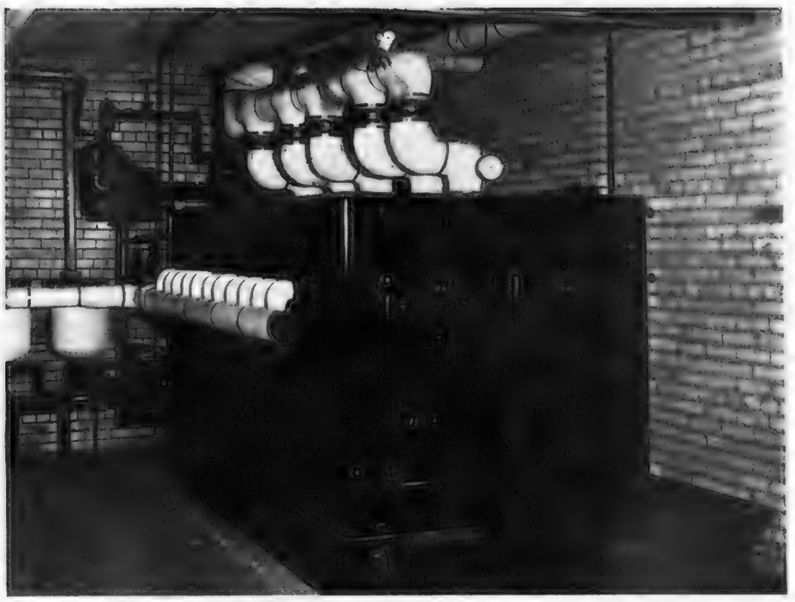
Piping systems have been greatly improved. Large pipes formerly used no longer are required. Smaller pipes are employed to carry a given load. Circuits are short and are not overloaded. Thus, the circulation of steam to all parts of the system is quick and positive.

It was the custom twenty-five years ago to carry 5 or 10 lbs. steam pressure in the heating supply mains. The old pressure heating systems are fast being supplanted by the more modern vapor-vacuum system carrying a partial vacuum of 5 or 10 in. on the supply mains, instead of a pressure. Consequently, steam circulates more rapidly at lower temperatures, with resulting fuel saving.

Twenty-five years ago I sold what was known as the air-line vacuum system of heating. This system and the two-pipe vacuum system were the beginning of the highly-improved vacuum systems now on the market.

The old blower systems of heating with charcoal or canvas air filters have been supplanted by the present-day systems embodying air-conditioning, humidity and automatic temperature control. The unit heater is the latest improvement in heating and ventilating. These little units, as I term them, are small in comparison with blower equipment used twenty-five years ago. They are adaptable to almost any type or class of building.

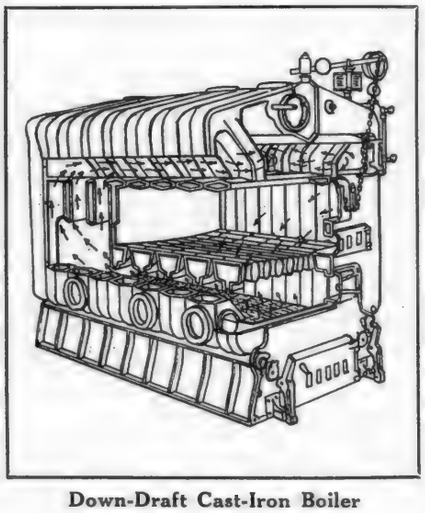
The progress made in the past quarter of a century has been so great that, from a standpoint of fuel economy, the efficiency, health, hygiene and comfort of occupants, owners of buildings and industrial plants cannot afford to have other than the most modern heating and ventilating equipment.



**Jacketed Sectional Boiler Finished in Colored Enamel and Equipped with Stoker**

# Coal-Fired Boilers—Their Change During the Quarter-Century

IN the days of the Florida magazine-feed boiler, the Spence water boiler, the Novelty Circulator, and the header-type boilers—Royal, Mills, American and Faultless Furman—manufacturers and designers of these devices claimed no special combustion advantages. At that time there was little said about length of firing periods, size of combustion chambers, or smokeless combustion. The features of construction were usually in the fire travel, the water circulation of the boiler, and the distribution and amount of heating surface.

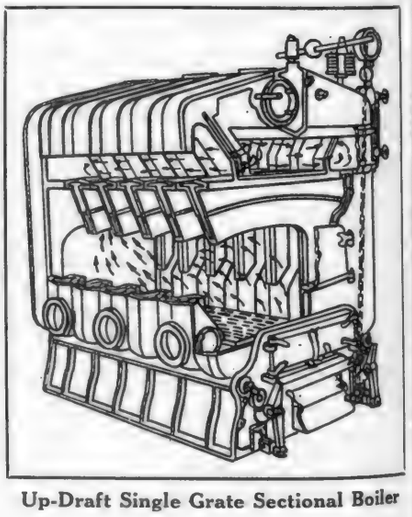


**Down-Draft Cast-Iron Boiler**

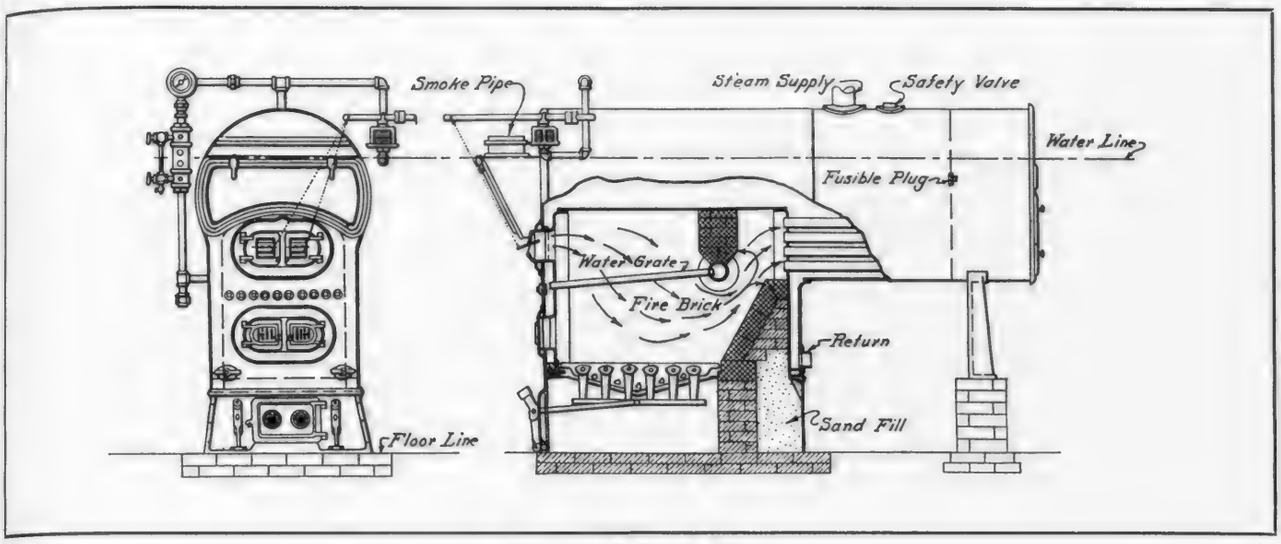
Claiming superior features in regard to circulation, the Humber, Ideal, Gurney and Novelty Circulator were all popular in the early days. The Florida was a jacketed boiler with a large amount of heating surface and long fire travel. The Spence water heater was a round horizontal sectional boiler with a back water post, in which the water traveled from one side of the post around the various sections into the other side of the post which was open to the piping system.

Among the steam boilers was the Soleil, with a special circulating water-way for equalization, which was considered necessary at that time. Made of cast-iron, with loops screwed into the dome, the Faultless Furman had double circulating drop tubes over the fire. The Bolton, an early steel boiler, had a double circulating tube. The Haxton, Dunning and Mahoney were other steel boilers of special design.

Progress made in the past twenty years in the design of coal-fired heating boilers has been gradual. During the first ten years after the opening of the twentieth century practically nothing seems to have been done. Changes in construction were those



**Up-Draft Single Grate Sectional Boiler**




**Down-Draft Steel Boiler**

of refinement, rather than principle. Most manufacturers had eliminated the header type of construction with its elaborate screwed header connections.

Gradually, however, the cast-iron boiler, which had dominated the heating field, began to meet more and more competition from the steel boiler. Just as the domestic stoker used today has been developed from the power units which have been made in small sizes to include the domestic and small commercial jobs, so the steel boiler has been designed in smaller sizes. Today, the steel boiler has invaded the commercial and domestic field to a considerable extent.

Due, no doubt, to the anti-smoke ordinances which occupied the attention of the major cities before the World War, designers turned their attention more and more to the study of fuel combustion in an effort to overcome the smoke nuisance.

Methods adopted to obtain the desired complete combustion included the use of the down draft grate and the use of a bridge wall. The down-draft grate type was so built that the coal was coked on the upper grate, where the volatile gases were distilled off, and the solid carbon burned on the lower grate. Boilers incorporating this feature were introduced in both steel and cast-iron types, and in some cases, the upper grates were of cast-iron, in others, of steel. Water was circulated through these grates to cool them.

The down draft principle also was used in boilers not equipped with two sets of grates. Where there were two sets of grates, the upper grate could be inclined or horizontal.

The purpose of the bridge wall in smokeless boilers not employing the down-draft feature was to provide a mixing chamber back of the grates in which the unconsumed gases could completely be burned before encountering the cold water-cooled surfaces in the flues. The wall was covered with a refractory material so that when this became incandescent it would aid in completing combustion.

Some types, in which the bridge wall design was incorporated, admitted the secondary air at this bridge wall. In other cases the secondary air was admitted over the fire in the front or side of the firebox.

The magazine-feed boiler also was used as a smokeless boiler. Air was drawn through the coal, and the flue sections themselves acted as a sort of grate.

In general, however, the magazine-feed boiler manufacturers have confined themselves to the development of boilers to burn small-sized anthracite, bituminous coals or coke, and their main feature has been the ability to do this economically and with long firing periods.

Unlike the devices used for heat distribution, which have undergone some startling developments, as in the case of the unit heater and heat cabinet, the development of boiler design has been gradual. The improvements in the magazine-feed boiler, the design of the smokeless boiler, and the entrance of the steel boiler into the heating field have been the chief accomplishments recorded in the past twenty-five years.

The latest refinement, and one which has attained a considerable degree of popularity in the last three years, has been the jacketing of the round, sectional and magazine-feed cast-iron boilers with casings finished in bright-colored enamel. A desire to make the basement a clean and livable room has been fulfilled in this manner, giving the basement an attractive appearance where formerly the heater was an eyesore.

Another recent development is a magazine feed boiler designed especially to burn coke. The boiler is of cast iron with a colored enamel jacket.

**Modern Jacketed Magazine Feed Boiler**

Drawings from "Gravity Steam and Water Heating," by A. M. Daniels.

**Radiator Enclosure Used as Window Seat**

# Evolution of Radiator Design

*by* **CLIFFORD STROCK**

RADIATORS in use in the late '90's and the early part of the twentieth century were of three general types: first, the ornate cast-iron column radiator (Fig. 2), many of which still are in use in the older buildings; second, the pipe column radiator (Fig. 3), consisting of pipes screwed into cast-iron headers, and, in some cases, connected at the top by 180° elbows. Some of these contained an inner pipe extending up through the outer pipe, the former being connected to the steam chamber in the header while the outer pipe, in which the condensation took place, was connected to the chamber attached to the return line. The pipe radiators usually consisted of 1-in. pipes about 30 in. long, and were made up in necessary lengths and multiples of rows to effect the necessary heat output.

The third class was a light-weight, sheet-metal radiator of the Kinnear, or pressed metal, type. These were built in sections and assembled into complete radiators by nipples much in the same way as the present type cast-iron radiator. Early radiators of this type were made at Marshalltown, Iowa, and some, installed in Kansas residences, have been in service for over 30 years.

An example of an early cast radiator is that of the "Bundy" made by the A. A. Griffing Iron Works, Jersey City, N. J., the first of which was built by William J. Baldwin in the shop of Charles Gregg, New York. They were similar to the pipe tube radiators in many respects and had a one-piece base into which cast-iron tubes were screwed.

The ornamental cast-iron column types first became well known through a curious incident. Early heating practice in New England concealed the radiators by using indirect radiators. An uncovered boiler was encased in brick with indirect Gold pin type radiators massed about the boiler. The warmed air was piped to the rooms much in the same way as the air in a modern warm-air system. A strike in the radiator industry in New England forced contractors to seek substitutes, and a Detroit manufacturer who had a considerable number of direct cast-iron radiators piled up like lumber in his Boston warehouse, easily sold them, and from then on the column type became the standard radiator.

At that time it was felt that the use of extended surface added little to the efficiency of direct radiators, but indirect radiation was usually so designed that there was extended surface either in the form of pins, as in the Gold pin type or spirals as in the Gold "compound coil surface" shown in Fig. 5. The latter consisted of No. 14 square wire in a helical form wrapped around the pipe, 1 lb. of wire being used for each lineal foot of pipe. This was said to condense three times as much steam as the bare pipe.

In industrial buildings, the pipe coil radiator, still in common use, consisted of long rows of horizontal pipe hung along the wall or overhead. The pipe was connected at each end by cast-iron headers.

The cast-iron radiator steadily increased in popularity and continued

practically unchanged in design for another decade. The one exception to this was in the appearance, which, in time, became less and less ornamental and more severe in line, until finally the surface was totally plain.

In 1917, patents were taken out on the Corto radiator (Fig. 1) designed by Louis Courtot, a Frenchman affiliated with the American Radiator Company. This was the first tubular-type radiator appearing in this country, and replaced the column radiator with one with graceful lines which greatly added to its appearance. Since that time, the tubular radiator has become the accepted standard for cast-iron radiators in America and Europe.

Dr. Charles W. Brabbee, in 1920, made a series of tests on stoves in which, for the first time in such tests, the value of the heaters were not compared on the basis of an absolute efficiency but rather by comparing the heating effect in respect to the amount of comfort rendered to human beings.

The stoves were set up in two rooms of small but practical size, and built exactly the same way with the same heat transmission under equal conditions. Room temperatures were taken at three heights, namely, 1½ ft. from the floor (knee height); 5 ft. from the floor (breathing line) and ½ ft. from the ceiling.

In 1922, this method of comparative tests in regard to human comfort was applied to radiators instead of the absolute investigation by measuring the condensation. Tests by Doctor Brabbee made on a 38-in.

Fig. 2. Ornamental Cast-Iron Radiator Used in the Early Part of the Century

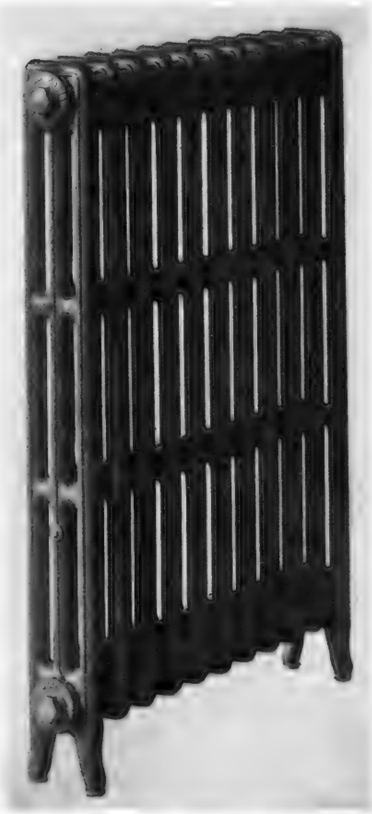


Fig. 1. Corto Tubular Radiator

Peerless flue type radiator and a 20-in. Peerless window radiator showed that although the latter condensed 11% less steam than the former, the heating effect, as measured at knee height, showed that the 20-in. radiator was 17% greater. Results of such tests led to the design of the Fantom type radiator, shown in Fig. 4.

The appearance of radiators has given designers no little concern, and various types of radiator furniture have appeared in large numbers. (See headpiece.) Radiator furniture can be classified as either shields or enclosures, the first being intended merely to throw out the heat into the room instead of allowing it to rise to the ceiling uninterrupted, and to offer a convenient shelf or seat. Enclosures, on the other hand, conceal the radiator completely. They have been made in a great variety of designs, of wrought iron, wood, and sheet metal. Tests on various types of enclosures showed that while many reduced the heating effect of the radiator so concealed, a proper design would actually increase the heat emission.

The effect of radiator finishes has been the subject of several investigations, and it has been found that almost any type or color of finish will prove superior to the gold or silver bronze which has so commonly been used. The tendency at the present time seems to be toward the use of colored enamels, such as white, gray, green and even red.

The idea of incorporating a complete heating plant in a steam radiator was first put to practical use by Robert S. Calef of Keene, N. H., in about 1897. The first model was not much different from an ordinary steam radiator with a filling device for maintaining a small amount of water in the bottom of the loops. A gas burner was suspended below the sections and was enclosed with a detachable sheet metal pan. A rubber diaphragm with steam on one side and gas on the other operated to control the steam pressure.

James B. Clow purchased the patents for Gasteam radiators about 1900. Twenty-five years ago Gasteam radiators were little more than an experiment. Manufactured gas companies were not actively selling gas for heating, except for auxiliary purposes.

Early successes of such radiators as a complete heating system in colder climates were counteracted, to a considerable extent, by the fact that up to 1920 only unvented types had been perfected. Water vapor, produced by the burning of the gas, often produced more humidity than could be accommodated without marked condensation on windows and cold walls of badly exposed, or poorly constructed buildings. Necessity

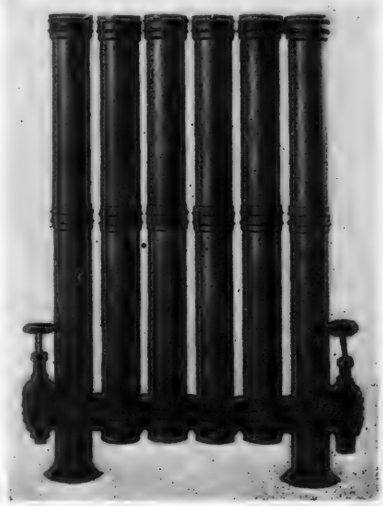


Fig. 3. Pipe Column Radiator in Use in the '90's

Fig. 4. Fantom Type Radiator

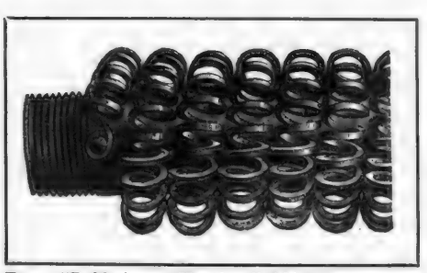
soon brought about the perfection of the vented type of radiators (Fig. 6), which carried to a flue the products of combustion which contained the offending moisture.

Fifteen years ago there was but one manufacturer of gas-fired steam radiators, while today more than a score of manufacturers are competing for this business in a market with a fast broadening horizon.

The flexibility of the gas fired radiator led to the appearance, about three years ago, of an electric radiator which can be connected to the electric light socket. This makes the electric type somewhat more portable than the gas-fired type, but the operating costs are considerably higher.

The widespread use of the unit ventilator and unit heater, especially after the Great War, acquainted engineers with the possibilities of lightweight alloys when used as radiating surfaces. In May, 1926, there appeared in THE HEATING AND VENTILATING MAGAZINE an advertisement of The Trane Company for a cabinet heater which weighed only a fraction of that of a cast-iron radiator of corresponding capacity.

This device consisted of a U-shaped copper pipe placed near the floor extending the length of a sheet metal casing. The pipe was covered with numerous rectangular sheets of copper fastened to the pipe and forming an extended surface. The cabinet had a grilled opening in the bottom front surface, through which the cold air entered, and a grille at the top front through which the warmed air was emitted away from the cabinet.



From "Baldwin on Heating," 1897.

Fig. 5. Gold "Compound Coil Surface" Indirect Radiation

The cabinet served as a chimney and drew the air through casing and over the pipe which was connected to the steam, water, or vapor system in the usual way. The advantages of this type of radiator were that it was light in weight, the surface could be painted or enameled to suit the room finish, and the cabinet could be lifted off to make cleaning easy.

Another step forward was announced the following month when the Herman Nelson Corporation brought out its concealed heater, or invisible radiator. A light-weight extended-surface element was used and placed between the studding behind the wall. A grille at the baseboard provided an entrance for the cool air, and a grille was placed above at a height depending on the ceiling height and the room requirements. A high flue gave a higher velocity to the air and an increase in capacity.

## Damper in Flue Makes Close Control Possible

With either the concealed or cabinet heater, made of copper, brass, aluminum, or some alloy of these metals, the heat emission is controlled by the introduction of a damper which can be set to leave the flue wide open, close it completely or allow any percentage of opening desired. These units are becoming more and more popular, and the competition between the more recent forms of cast radiation and the light-weight heaters has become spirited.

Tests by manufacturers, universities, and independent research laboratories will throw more light on the subject of the proper measurement of heating effect and the results to be obtained from the use of the types now being used and perhaps lead to the development of still more efficient and effective heat-emitting devices.

Fig. 6. Gasteam Radiator at Left, Unenclosed; Under Window at Right, with Enclosures

# High Spots in the Progress of Vacuum and Vapor Heating

ANY account of the development of vacuum heating must start with the work of the pioneers, who bore the heat and burden of the day in making it a commercial success. This success did not come over night.

Prominent in the list of brave souls, who backed the new method with all they had, was Andrew G. Paul, whose death, in 1915, ended a spectacular career during which he made a fortune only to lose it.

The story is still told of how, in 1890, William Skiffington, then in the employ of the Fairbanks Company, on Broadway, New York, invented vacuum return-line heating. His work bench was at the back of the store, where the glass roof sloped toward the rear wall. Skiffington was required to report for duty before steam heat was generated in sufficient quantities to warm his shop, so he conceived the idea that if he could draw the air out of his coil and create a partial vacuum within the coil, the first steam generated would flow to his shop.

There was a Jenkins air valve with a carbon post to the coil in his shop, to which he attached a ¼-in. pipe and ran the same to the basement and connected it to the boiler-feed pump. By this means he eliminated the air from the coil and created a partial vacuum within the coil; consequently the first steam would flow to his shop.

A day or two later, Andrew G. Paul, the company manager, walked into Skiffington's shop and noticed that it was comfortably warm, while his own office was cold. He asked, "How is it your shop is always warm before the rest of the building has the chill taken off?" When Skiffington explained how he had accomplished his desire for heat, Paul exclaimed, "Why, man, you have made an invention."

**Warren Webster**

An Early Pioneer in the Field of Vacuum and Vapor Heating

And so he had. His invention marked the beginning of vacuum return-line steam heating. While the patents taken out were in his name, Andrew G. Paul was the guiding spirit in its commercial application. He managed to raise $50,000, and organized the New England Vacuum Heating Company in Boston, which, later, became the New England Paul System Company.

But it was one thing to invent a system and another to put it over in a commercial way. After losing most of his capital, Mr. Paul, in 1898, sold out the rights in the Skiffington and Paul patents for the New York district to Albert A. Cryer, who had been associated with Mr. Paul in his experimental work. Mr. Cryer made the Paul System the fashion, and equipped hundreds of buildings throughout the metropolitan district with the Paul system of heating.

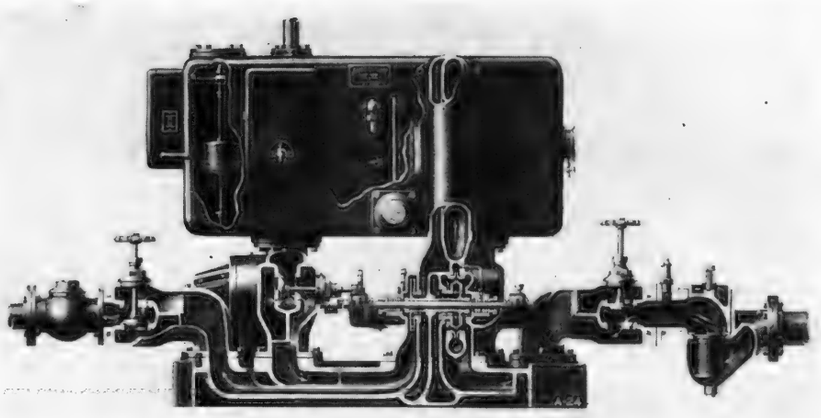
At about the same time that Andrew G. Paul became active in the vacuum heating field, Warren Webster, of Warren Webster & Company, Camden, N. J., acquired a patent on a vacuum heating system designed by George Barnard, of New York. In that system, the suction line was connected to the return end of the radiator, instead of to the air valve. It provided for by-passing the vacuum return-line through a heat exchanger of suitable type, cooling the returns and putting the heat thus given up to useful purposes.

Going farther back, however, the maintenance of a partial vacuum in the return line of a heating system produced by mechanical means is the outgrowth of two basic patents, one issued in 1878, to DeBeaumont, and the other in 1882, to Napoleon Williames. Both of these patents were acquired by Warren Webster & Company and are considered the basis for the development and commercial exploitation of that company's vacuum return-line system.

So strong, however, was the Paul or Skiffington patent, that Mr. Paul, during the life of his patent, was able to collect royalties on all installations of vacuum return-line heating. Eventually Warren Webster & Company purchased that patent also.

In the Chicago district, the Paul patent rights fell into the hands of C. F. Fowler, a former congressman from New Jersey, who, with his brother-in-law, James E. Heg, formed the Automatic Heating Company. Later the company's headquarters were moved to New York, but it continued to operate in the Middle West.

While originally the royalty charged by Andrew G. Paul was one cent per square foot of direct radiation, this figure had risen to ten cents a square foot at the time Warren Webster &



**Vacuum Pump and Receiver of the Continuous Centrifugal Rotating Jet Type**

Company and the Automatic Heating Company became active in the field.

By 1911, the Paul and Skiffington patents had expired.

In the early days, pumps were required in connection with high-pressure steam for power because, at that period, vacuum systems were applied principally to buildings and plants using exhaust steam and having boilers of the high-pressure type. From 1900 on, there was a falling-off in the installation of isolated power plants coincident with growth of centralized power and light stations. This led, first, to the development of low-pressure steam-driven pumps, then to the reciprocating type of power-driven pump and finally to experimentation with the rotary and exhauster types of power-driven pumps with electrical drive. In the exhauster pump here illustrated, which is an electrically-driven centrifugal pump, hurling water is employed on the kinetic ejector principle where the energy possessed by a stream of water in motion traps the air and vapors to be exhausted and carries them into a receiver where they separate and escape from the water. A distinctive feature of this type of pump lies in its ability to draw high degrees of vacuum efficiently.

The gradual transition from exhaust steam to live steam generated at low pressures led to other developments in steam heating systems in which the general vacuum principle was maintained.

Early attempts to use the vacuum principle in steam heating led to experiences which indicated a need for and resulted in the development of much special equipment. The radiator return trap was one of the first of these devices for which a definite need was found. After experimenting with manually-restricted valves in various forms, Warren Webster & Company acquired the Willis R. Hall patent issued in 1891. This may be said to mark the beginning of the development of thermostatic traps.

The first efforts resulted in the well-known carbon post form of trap. In 1897, the company acquired the Chase patent covering a thermostatic trap with a flexible metal diaphragm containing a volatile fluid.

In 1903, C. A. Dunham, of the C. A. Dunham Company, marketed the first fluid-filled thermostatic trap capable of satisfactory operation over a fairly wide range of pressures and temperatures. With this device, air and condensate could continually be drained from each heating surface and steam confined to the radiators and supply piping under a varying range of pressure incident to the operation of a low-pressure boiler. A positive difference in pressure from the supply to the return piping could be maintained over this same pressure range.

From 1900 to 1909, much pioneering research work was conducted in the development of both diaphragm and float-actuated traps operating on the differential principle. During this period much work was done in further perfecting the thermostatic trap. In this connection interesting dates are 1910, when the Webster Sylphon trap was brought out, and 1911, when the Webster No. 7 multiple-diaphragm trap was placed on the market.

The Sylphon bellows principle had been invented by W. N. Fulton, of the Fulton Company, in 1904, but it was several years before the possibility of applying this principle to thermostatic traps fully was realized.

One of the problems continually before the manufacture was the design of a system flexible enough to meet the wide variation of weather and temperature. The heating profession realized that there was a large amount of heat wasted during winter and mild weather on account of overheating. This overheating was due to the fact that the radiation was installed to heat the building in the coldest weather, and the ordinary vacuum return-line system was designed to operate with a constant pressure of from 0 to 5 lbs., regardless of whether the outside temperature was minus 10° or 50° F.

Many devices have been designed to control heating systems to maintain proper room temperatures to solve the problem of fuel saving and to maintain comfortable living con-

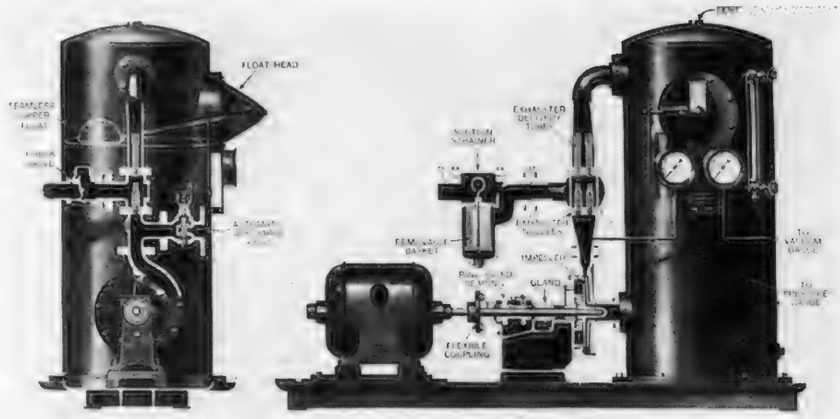
**Typical Condensation Pump and Receiver**

ditions. A recent achievement is the development by C. A. Dunham, of the C. A. Dunham Company, of a method of maintaining uniform room temperatures so that the heat given off by the radiators just equals the heat loss from the building. It is known as the Dunham differential vacuum heating system. The first commercial installations were made in 1926.

A distinguishing characteristic of the Dunham differential vacuum heating system is its use of pressures varying from atmospheric and above to 25 in. of vacuum and a temperature range of steam from 212° and above to 133° F. On very mild days, the steam supplied to the system under high vacuum further is reduced so that the radiator is only partly filled, thus further reducing the heat output from the radiators.

The system ordinarily is designed to heat with 2 lbs. steam pressure, when the outside temperature reaches the base design temperature. The same base temperatures are used as is common practice with other types of vacuum heating systems. When the outside temperature rises, steam pressures are reduced in proportion, supplying the radiators with low-temperature steam of varying degrees (as low as 133° F.).

Steam is controlled by sub-atmospheric pressure-reducing valves located at the boiler or where the service line enters the building. The valves may be controlled either manually or by one or more thermostats located in key rooms wired so that the thermostat in the coldest room takes charge. The differential system is adaptable to zone control by using a separate set of sub-atmospheric pressure-reducing valves and a separate set of piping for each zone.




**Differential Vacuum Pump and Receiver**

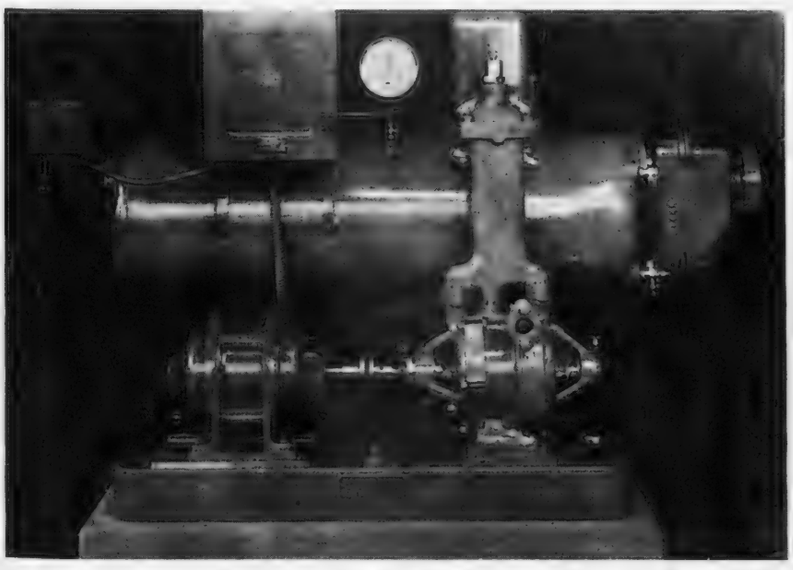
More recently the Webster Moderator system has been placed on the market by Warren Webster & Company and has been offered to the public on a limited production basis.

An early type of gravity vacuum system was placed on the market about 30 years ago by James A. Trane. This early system utilized an air-line hook-up with a Paul valve at the radiator and an air-line connecting these valves to a mercury seal, which operated to prevent air from returning to the system.

By 1910, the engineering profession quite generally had accepted the two pipe return-line vacuum heating system for large building work, while the two-pipe vapor system was making its appearance in the better type of home where close temperature regulation was required. Among the companies which figured prominently in this development in addition to those already mentioned were the Illinois Engineering Company, the Thermograde Valve Company, Hoffman Specialty Company, McAlear Manufacturing Company, Sarco Company, William S. Haines & Company, American District Steam Company, James P. Marsh & Company, and more recently Barnes & Jones, W. D. Cashin Company, Gorton Heating Corporation, Simplex Heating Specialty Company, Sterling Engineering Company, and the Vapor Engineering Company.

To meet the demand for a system that would give a close regulation of temperature, the Trane Company, about 30 years ago, introduced its original vapor system, which was open to the atmosphere through a device known as the "return fitting," attached to the end of the radiator. All the supply piping entered the tops of the radiators and unless the systems were forced, the steam did not enter the return through the minute hole provided in the return fitting for the passage of air. A safety feature in the form of a receiver was installed on all systems to equalize the pressure between the supply and return and allow the condensation to flow back into the boiler, instead of building up in the return, if an excessive pressure should be generated.

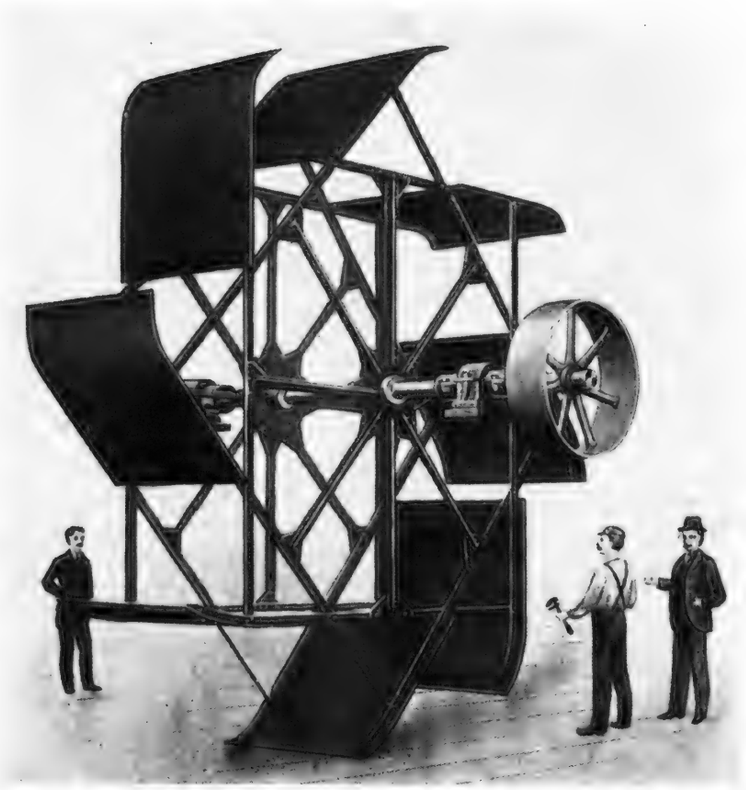
More rapid development in recent years has been the result of the service organizations of the various large companies.



**Rotary Type Vacuum Heating Pump and Receiver**

# Twenty-Five Years of Fan

*by* **CHARLES E. LAWRENCE**



**Guibal Fan Used as Late as 1906 for Mine Installation**

A SEARCH for data bearing on the early stages of means for moving air seems to disclose a dearth of literature on this subject. Prior to the year 1900, little is to be found and then we must go to the French or Germans for our starting point; particularly the former, for the Germans seem rather to have followed the French. Professor Ser at "L'Eccles des Arts et des Metiers" at Paris seems to be one of the very first to have given this subject any serious scientific consideration.

Little did Professor Ser dream that investigations recorded by him in the year 1862 would have very pertinent bearing on a hotly-contested patent suit brought in the United States of America over fifty years later.

The decision rendered by the courts in the suit brought by the American Blower Company against the Sturtevant Company for an alleged infringement of the Sirocco patents was influenced largely by this work of Ser's.

It seems that Davidson learned much from Ser, though perhaps unwittingly.

Professor Ser's work still is confined to its original French, which unfortunately locks the volume to many. Yet much can be gleaned from it through references made by those who have had access to the book.

The New York Blower Company honored Professor Ser by naming its first multiblade fan the "Seri-Vane."

Among those who make frequent reference to the work of Ser is another Frenchman by the name of Murgue. In a treatise dated 1878-D Murgue sets forth a great deal of data observed from actual tests and also gives much of the theory and principles involved.

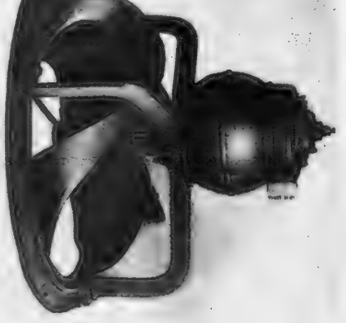
In this country the most practical application of Murgue's observations to the blower business was made about twenty-five years ago by F. R. Still, now vice-president of the American Blower Company.

There is more real meat in a paper read by Mr. Still about 1902, before the Western Society of Engineers than one can find in many volumes by others. Yet one can easily detect the influence of Murgue upon Mr. Still's work.

Murgue refers to the inefficient methods used by some in their efforts to move air, such as the "screw," the "helix" and "vanes," like the Dutch windmills. In these we are not interested; so we turn to the beginning of the blower as we know it today. These are of the centrifugal type. Much of the following is taken from Murgue. An early type of wheel had blades starting tangentially at a central disc or hub, curving gradually up and out, terminating radially at the outside edge. Another had blades starting out at about 45° from the radial, curving backwards, terminating in a tangent at the periphery.

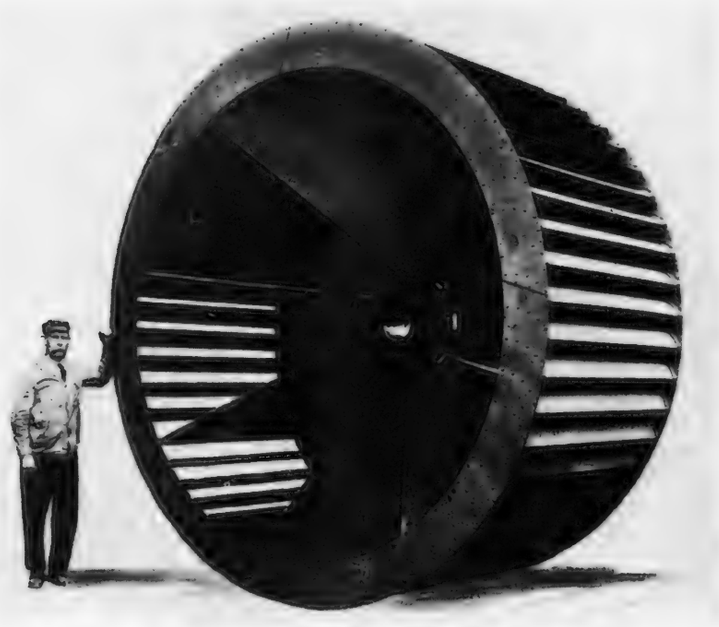
This wheel was a signal failure. It appears that these fans or blowers were applied chiefly or exclusively to mine ventilation; but laboratory tests were employed with resort to "The Equivalent Orifice" to reproduce the conditions obtaining in the mines.

Much good work was done by Guibal, another Frenchman, who designed several types of wheels particularly suitable for mine ventila-



**Davidson Propeller Fan as Made in 1907**

# Years of History



**Largest Squirrel Cage Fan Ever Built**

tion. The Guibal wheel was built in America even at the beginning of this century, and was catalogued by one blower company.

The early fans were used for exhausting only, and had no housing. This impaired their efficiency, while not precluding their application. Guibal suspected or detected this and applied a housing built like a drum. This improved the fan materially, as we shall see presently.

It was then considered that the wheel blades should terminate radially; thus was evolved a wheel of several blades, starting tangentially from a central hub, or inlet, curving up and out, and continuing radially to the periphery. This wheel probably survived for some time. Its direction of rotation was with the toe of the blade forwards.

Murgue pointed out, what very few engineers seem to grasp today—that operating a blower under fixed conditions, with varying speeds, accomplished nothing but the repetition of the same test. In other words, for a given set-up the performance of a fan is the same, whatever the speed, except that the volume varies directly, the pressure varies as the square and the brake horsepower varies as the cube of the speed. Whereas, change the setting of an outlet or inlet damper, and the fan performance changes immediately. In other words, it is operating at a different point on its performance curve, and at a different efficiency.

**Multiblade or Squirrel Cage Fan**

In his comparison of the conduct of different fans, Murgue gives an excellent chronology of fan development:

1842—Vertical—three blades no housing

1849—Still, vertical, four blades (130°) no housing.

1865—Guibal, vertical, no housing.

1865—Lambert, vertical, eight blades, no housing.

1865—Housing with evase chimney.

Yet the housing was used as early as 1859 with startling results. These figures are relative and are not to be taken as mechanical efficiencies as we know that term today.

Wheel without housing—327.

With housing, no chimney—560.

With housing, and rectangular chimney—606.

With housing and evase chimney—650.

While this work was being done in France and elsewhere on the continent, Davidson was developing the propeller fan which bore his name, and later produced the Sirocco fan, which caused such an upset in this country during the early years of this century.

In America, quoting from an article in the March, 1914, issue of *World's Work* by F. Burnham McLeary, we are told:

"Now this man, Sturtevant, was a Yankee and brimful of Yankee brains. One industry it appears, did not satisfy him; and so when his workmen complained that a shoe buffer he had made stirred up a fearful cloud of dust, Mr. Sturtevant made a study of the blower problem. The result was a little exhaust fan which seated itself close to the buffing wheel, and sucked away every particle of leather. The air was left clean as a whistle. Thus came into being the first satisfactory exhaust fan, and the father of all the modern fans and blowers in use to-day."

So writes Mr. McLeary; but Mr. McLeary seems to overlook Professor Ser.

Still the blower business in America for many years centered around this one man, Sturtevant. He knew little about theory, but he made application, and certainly founded well.

For many years the U. S. Navy was dependent entirely upon the Sturtevant output, and depended up-

on Sturtevant method of tests; which, naturally, even without intent, handicapped all other aspirants.

Not many years after the work done by Sturtevant in founding his great industry, a firm by the name of Hyatt and Smith in Detroit started to make blowers on a small scale. At this time these fans and blowers were not standardized and much difficulty and confusion resulted, especially in trying to compare one blower with another.

Out of Hyatt and Smith grew the American Blower Company, a close rival for the Sturtevant Company in purely the blower business. The American Blower Company has done much in developing the art in America and has been a large factor in forcing standardization and in working out accurate methods of testing and rating fans and blowers. Back of all this, one individual stands out very conspicuously; that man is Fred R. Still, who for many years was the chief engineer for the American Blower Company.

From these small beginnings of little more than half a century ago we now find nearly all the industries using blowers in one application or another: drying, heating, conveying, ventilating, refrigerating, conditioning air, mechanical draft and what not. Interior spaces have been made available through adequate ventilation; buildings several stories underground are supplied with fresh pure air; tunnels through mountains and under rivers have their air kept pure and clear.

The greatest accomplishment in this connection is the ventilation of the Holland tunnels in New York under the Hudson River, nearly two miles long. With thousands of automobiles discharging their gases of

Steam Turbine Driven Multiblade Fan

combustion, the air is maintained constantly at a purity well within the limits of safety.

Somewhere between 1895 and 1900, the Davidson Fan Company started manufacturing the Davidson propeller fan with supposedly exclusive American rights.

At that time the General Electric Company and others marketed disc or propeller fans with their own motors attached, through their own agents and jobbers. This business assumed large proportions and the General Electric Company was a large consumer of Davidson fans.

These propeller fans brought the Davidson Fan Company in contact with users of the centrifugal or steel-plate fan, and they became ambitious to enter into the field as a competitor for this class of apparatus.

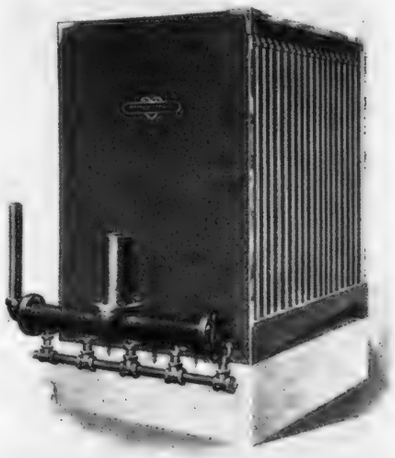
In the meantime the Buffalo Forge Company had expanded and other companies had sprung into being, such as the New York Blower Company, the Buckeye Blower Company and some others. But the two principal companies in 1900, for general blower products, were the Sturtevant and American Blower companies.

Soon the market detected the efforts of an outsider, an unknown, to break into the field. The Davidson Fan Company became the Massachusetts Fan Company. The firm opened a New York office; they issued a catalog; they offered to furnish steel-plate fans with ratings rivaling those of the American Blower Company at a somewhat lower price; they offered pipe-coil heaters, then used exclusively, as Vento had not yet come into being, but was almost ready to be born; they offered the Davidson propeller fans; the Troy engine, then the one best rival of the American Blower's newly-developed Type "A" enclosed self-oiling, vertical engine; and they particularly stressed their brick-drying fans.

This situation was not taken very seriously by the two large companies who, at that time, controlled the New York market. At this juncture the Sturtevant Company commenced building economizers, not content with furnishing all the blowers used by the Green Fuel Economizer Company.

The Green Fuel Economizer Company retaliated by entering the fan field, bringing engineers from abroad for that purpose. The fight was on, and prices went to smash.

The New York Blower Company moved its main offices to Chicago. Its former representative, D. T. Lyon, who had served each blower company in turn, cast his lot with the Pittsburgh Stoker Company. Later he became connected with the Massa-



Pipe Coil Heater for Fan Blast Installations from Catalog Issued 20 Years Ago

(Left) This Fan is an Intermediate Step Between the Paddle and Multiblade Types

(Right) Cone Fan, 1907, of Type Entirely Obsolete

chusetts Fan Company, managing the New York office.

Much to the surprise of everyone D. T. Lyon sold through the Thompson-Starrett Company two blowers, and Troy engines for the 59th St. plant of the New York Steam Company. It developed later that there were reasons back of this not appearing on the surface; but the sale was made, and the apparatus was furnished by the Massachusetts Fan Company, and they had their start right there.

The president of the Massachusetts Fan Company in 1908, was a man named Horace Chenery, a son-in-law of George A. Fuller, and brother-in-law of Harry Black. Mr. Black was then chairman of the board of the George A. Fuller Company.

Just at this time the Sturtevant Company had put on the market their multivane fan, supposedly an infringement of the Sirocco. The Buffalo Forge Company also produced a similar fan under patents purchased by them; but they later changed to the conoidal type.

The Sirocco Company of Belfast had started an American factory at Green Island, near Troy, N. Y. This plant and all American rights were purchased by the American Blower Company and they developed the American Sirocco fan, through modification of the housing.

Almost over night the demand for the old steel-plate fan ceased; and the call came for the multivane type. Not to be caught napping the Massachusetts Fan Company developed the squirrel cage fan.

To avoid patent conflicts certain blades were extended towards the centre, ostensibly to strengthen the wheel. As first produced this wheel operated at speeds even higher than did the Sturtevant multivane, though at a sacrifice in efficiency. Some of these fans are now operating in prominent buildings in New York.

The first notable sale of fans of this type was to the E. W. Bliss Company to be used with their turbines at the New York Central West Albany power plant. They are still there, but with new wheels.

In 1914, the American Blower Company, having obtained a decision against the Sturtevant Company on the Sirocco patents, turned their attention to the Massachusetts Fan Company, serving notice of suit.

In August of that year the World War broke out. By October, 1914, the Massachusetts Fan Company had stopped making the squirrel-cage fan. On December 1, 1914, the Massachusetts Fan Company ceased to exist. The Davidson propeller fan business was turned over to H. D. Lloyd in lieu of unpaid salary and other considerations.

In February, 1916, the Consolidated Engineering Company purchased all property, rights and patents of the former Massachusetts Fan Company. They already had acquired the Thermograde Valve Company of Massachusetts, the Kinealy air washer, and many Van Auken patents.

The Massachusetts Blower Company then came into being and resumed where the Massachusetts Fan Company had left off.

In the meantime, the Sturtevant Company had secured from the Supreme Court of the United States a reversal of the decision rendered by the New York State courts.

The Massachusetts Blower Company then improved the old squirrel-cage fan, and produced the modified type, of higher efficiency, and operating at lower speeds. At this juncture Mr. Van Auken, president of the Consolidated Engineering Company died. For a while Walter E. Barnes who had been general manager, carried on the business until in March, 1918, the Bishop and Babcock Company purchased the plant and the assets of the Consolidated Engineering Company, retaining Mr. Barnes as manager. The rest is pretty well known to all.

In 1917, the National Association of Fan Manufacturers was formed with E. B. Cresap, secretary, and many beneficial changes in fan customs have resulted from the cooperative action of the companies. The principal one was the joint adoption, in 1924, by the American Society of Heating and Ventilating Engineers, and the Fan Manufacturers of the Standard Test Code. Today most fan manufacturers issue catalogs whose fan ratings are in conformity with all the requisites of this Standard Fan Test Code.

# How Practice Has Changed in the Use of Piping

*by* **Frank N. Speller**
*Metallurgist, National Tube Company*

TO one who has been in touch with the heating industry for the past twenty-five years it is interesting to to look back on the changes that have occurred in the use of constructional materials. At the beginning of this period most of the pipe used in heating systems was screw-joint wrought-iron; now, as a result of tests under service conditions, over 95% of such pipe is wrought-steel of a quality much superior in all respects to that made heretofore. Welded joints offer advantages over threaded joints for tightness and strength.

Hot water systems have shown practically no depreciation even in fifty or sixty years of service, but in some localities, particularly where the boiler water is high in bicarbonates, steam return lines suffer more or less damage.

The fact that this is due to local conditions rather than to any fundamental difference in the durability of the material is now generally recognized to be the case. Fortunately the localities are few where this trouble is very acute. In such cases the practical remedy at present seems to be periodic treatment of the water in the boiler to prevent evolution of carbonic acid with the steam rather than to use a more expensive material than steel or wrought-iron, which suffer equally. Experiments are now under way to develop an inert lining for wrought-pipe or an alloy steel pipe (seamless) that can be furnished at an economical price for this purpose.

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A new product has recently been placed on the market in the form of alloy cast-iron piping, threaded for screw connections, and designed particularly for use in condensation lines.

# The Line of Progress in Ventilation

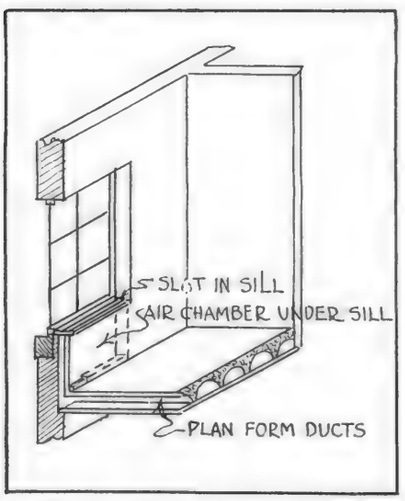



**Fig. 1. Method of Admitting Air to Rooms in Certain Detroit Schools**

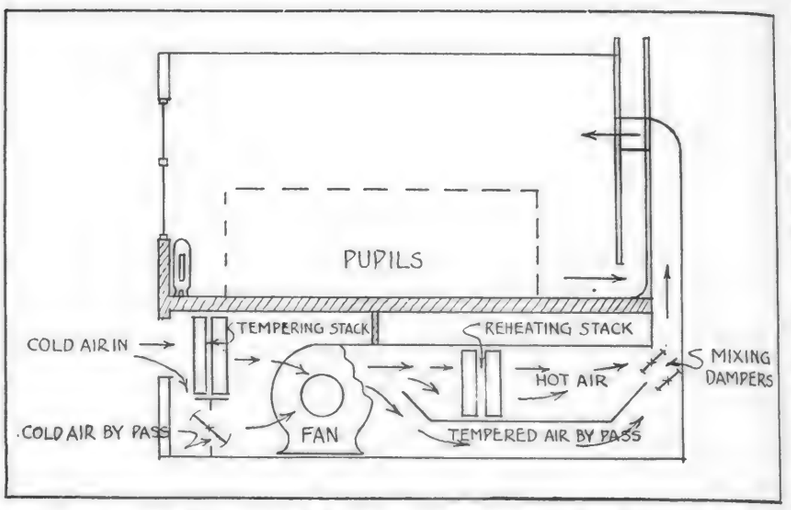



**Fig. 2. Mechanical Delivery of Warm Air in Connection with Direct Radiation**

IN the period represented by the past quarter-century, mechanical ventilation as a science has run the gamut from 100% outdoor air supply to complete air recirculation through an air washer, filter, or ozone machine, or through all three.

In 1905, it was common practice to heat and ventilate schools, auditoria, theatres and the like, by means of fan blast systems, sometimes supplemented by direct radiators. As all the air was taken from outdoors, the system had to be of adequate capacity and this entailed layouts, which, in the light of later knowledge, seem little short of extravagant. Not only that, but the cost of operation placed the temptation continuously before the operating engineer of shutting down the plant at every opportunity.

One measure taken to thwart this practice was the elimination of all direct radiation, making it obligatory for the operating engineer to run the fans in order to get the rooms up to temperature and to keep them there.

Fig. 2 illustrates diagrammatically a typical system of that period with mechanical delivery and mechanical exhaust. Systems operating on this principle were used extensively and successfully since they combined all the desirable features of previous methods, with none of their disadvantages except first costs.

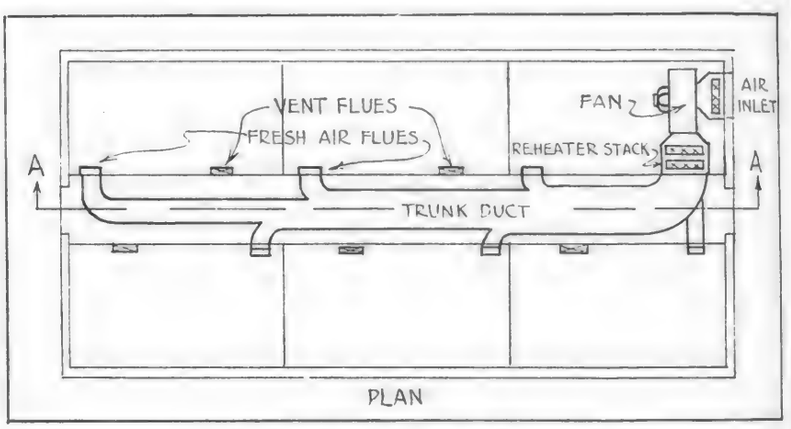



**Fig. 3. Single Duct System of Ventilation**

Distribution of the air to the various rooms of a building was accomplished by a variety of methods. The simplest form was the trunk system, which was subdivided into two classifications, single-duct and double-duct. The single-duct trunk system (Fig. 3) with its indirect stack, usually hand-controlled, by-passed by a cold air channel with a thermostatically operated damper, did not permit the regulation of the temperature of the air to the individual rooms. Unless automatically-controlled radiators were provided in the rooms there was no control of the temperature of the room whatever.

When the single cold-air bypass was replaced by a cold-air duct below the tempered-air duct, a mixing damper coud be arranged at the base of each vertical flue to the individual rooms. This constituted a double trunk system and is shown in Fig. 4.

Still another development was the individual duct system (Fig. 5) by which individual horizontal ducts could be run to each vertical flue.

At that time, air inlets to the room generally were located 8 ft. above the floor on an inside wall opposite the windows, while the outlets from the room were on the same wall at the floor level. Later on, the introduction of unit ventilators led to complications, particularly where the height of the wall inlets was regulated by law. In such cases, it was necessary to extend the air-delivery openings from the top of the units to the required height in the wall.

By the time air washers became

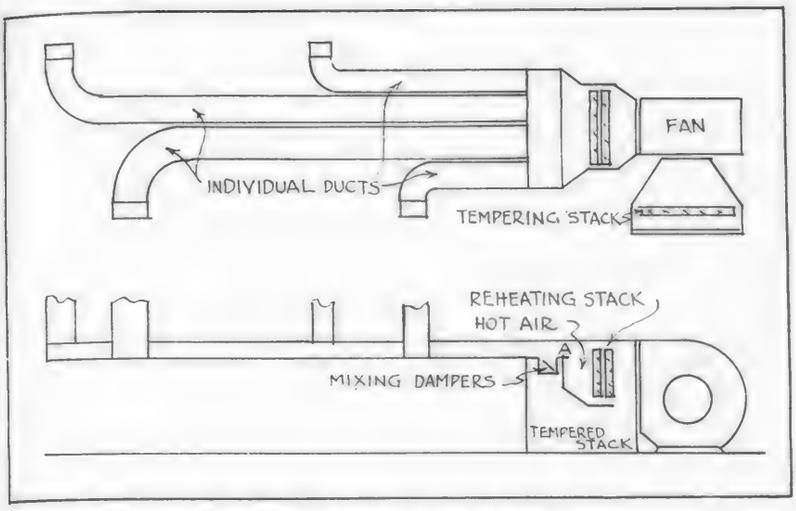



**Fig. 5. Individual Duct System**

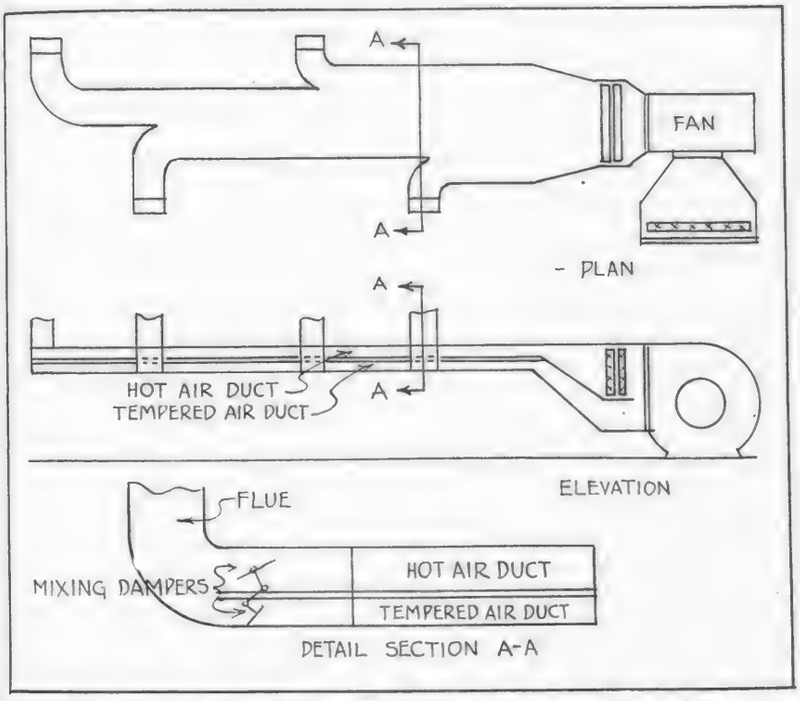



**Fig. 4. Double Trunk System with Mixing Damper at Base of Flue**

integral parts of well-designed fan-blast systems, the fallacy of the $CO_2$ air test, as a criterion of its purity, had been pretty well established. In places which were not subject to state laws or local requirements, it became common practice to recirculate the air. In St. Louis, Edwin S. Hallett, chief engineer of the St. Louis Board of Education, adopted the use of ozone in connection with air-recirculation systems in schools, which attracted wide attention. It is an interesting commentary that in many engineering quarters, approval of his course has come only after his death, which occurred last March.

A recent development in the method used in certain Detroit schools (Fig. 1), wherein 20% of the fresh air enters the room through a ⅛-in. slot in the window stool beneath the windows. The purpose of this is to admit enough auxiliary air to overcome the chilling effect of air entering the windows.

When the New York Commission startled the engineering world in 1923 with its findings to the effect that mechanically-ventilated rooms showed a prevalence of disease over those in which ventilation was produced by natural means, using the windows as a source of fresh air, it started an agitation, which was continued for years.

The system recommended by the commission is shown in Fig. 6. Direct radiation is used to heat the fresh air entering through the lower sashes of the windows which are provided with suitable deflecting shields. Regulation of the radiator is by means of an automatic thermostat on the opposite wall; ventilation is controlled by the teacher by raising or lowering the windows. Gravity exhaust ducts at the floor level are recommended.

It will be noticed that all of the mechanical systems which have been described have the common characteristic of admitting the coolest and purest air at one side of the room. This air is swept over the pupils horizontally, each pupil adding more heat and moisture, so that by the time the air has passed over the last row it has reached its maximum temperature and degree of contamination. The result is that only one row of seats in the entire room could, theo-

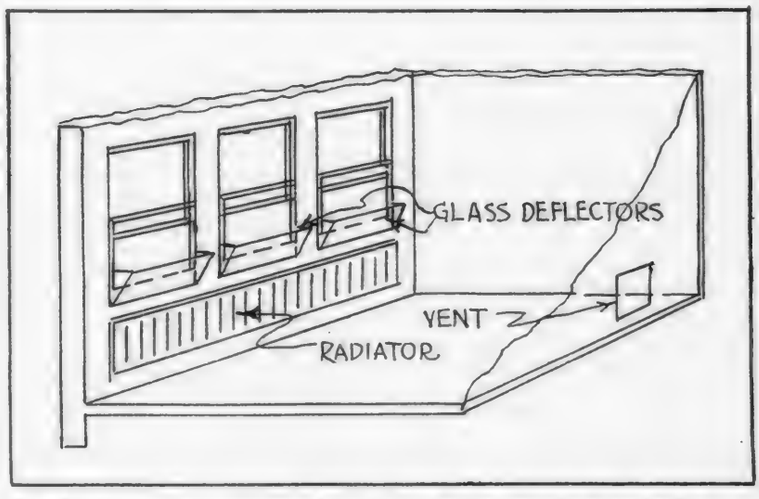



**Fig. 6. System Recommended by New York Commission on Ventilation**

retically, have the desired conditions of temperature and humidity. To prevent extreme variations from the average, a relatively high rate of air change is required.

As a means of correcting this situation, ceiling or floor distribution of air was tried out. Notably in Detroit, for instance, a typical installation in the Detroit Intermediate School (Fig. 7) consists of a number of registers placed flush with the ceiling, discharging straight down. The air descends in the form of a pyramid, reducing in velocity from 250 ft. per minute at the register face to 90 ft. per minute at the breathing line. The air is introduced into the room at about 85° F., the temperature being controlled by mixing dampers in a sub-corridor tunnel, actuated by thermostats in the room.

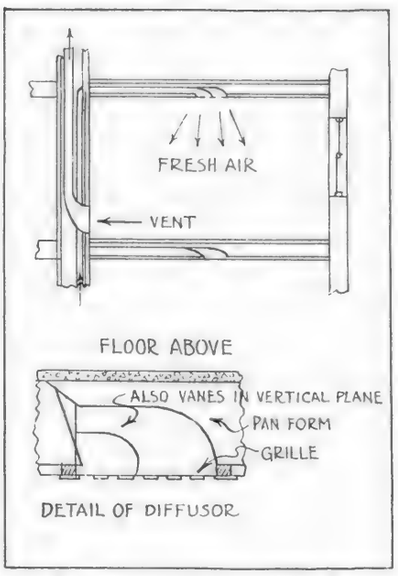



**Fig. 7. Overhead Distribution System Installed in Detroit Intermediate School**

**Fig. 8. Rotary Type Air Filter**

Direct radiation within the room provides for 75% of the wall and window heat loss.

In theatres and in school auditoria with fixed seats, mushroom floor ventilators successfully were combined with ceiling or wall registers. Previous to 1890, a form of wall grille had been used as the air distributing medium to audiences in large auditoria. In that year, George E. Knowles, a master patternmaker, was given a crude sketch for a ventilator to be placed under the seats in assembly rooms and connected with a blower system by ducts. After the first installation proved a success, Mr. Knowles began the manufacture of this mushroom ventilator, first having improved on the original design. Since that time many improvements have been made in the mushroom ventilator but the basic principle remained the same.

With this type of device, the direction of the flow of air is optional with the designer, both upward and downward ventilation being practiced to an equal degree. Using the upward scheme, the natural tendency of the warmed air to rise aids in securing proper ventilation. However, since the air comes up from around the feet, it carries with it the dust and odors from the feet, an undesirable condition. Also, chilling is much more likely to occur with the up-feed than with the down-feed system.

An important development in ventilation is the so-called "dry" air filter including the cell, rotary and rod types, the latter two being self-cleaning. For years engineers had been using cloth screens, while previous to that they had experimented with coke filters, string filters and many other ingenious contrivances for the elimination of dirt.

The increased industrialism of our cities injected the problem of smoke and soot and this brought forth oil-coated air filters. At first the units were hand-operated, being succeeded later by automatically-operated machines of ingenious construction.

Dry filters of the cell type consist of a cell filled with metal-wool soaked in oil which acts as an adhesive for the entrainment of dust particles. To clean this type of filter, the cells must be removed and washed in fresh oil. The rotary filter is made up of a drum covered with cloth of fine texture impregnated with oil. Oil is contained in a pan at the base of the unit, the drum revolving so that a fresh oil surface constantly is maintained. The rod-type filter depends upon the change in velocity of the air passing through a row of streamline rods covered with oil to cause the dust to fall out of suspension. Periodic flushing of the rods keep them primed for use.

The last few years, of course, have witnessed the increasing use of the unit ventilator. These units comprise a whole ventilating system in themselves since they include an air inlet, filter, fan, heater, recirculating system, means of efficient distribution, and thermostatic control of the mixing dampers and heating element.

**Fig. 9. Typical Battery of Air Filters**

# Trends in Heating System Design

*by* **WEBSTER TALLMADGE**

THE art of designing heating systems has experienced interesting and remarkable developments, with an ever-increasing tendency toward incorporating more scientific technique resulting in:

1—Better economy
2—Increased comfort
3—Lower first cost
4—Reduced maintenance

Manufacturers of radiators and heaters have studied the radiant and convected heat to such an extent that the steam used is more effective in securing uniform results in comfort. In some methods the cold-air stream, flowing downward from window surfaces, passes to the air-inlet space of the radiator or heater, avoiding turbulent opposition of downward cold air and upward warm air. By this means the heat transfer of the glass is reduced.

The American Society of Mechanical Engineers has set in motion a means of stabilizing the use of the heat unit by recommending the following.

B = B.T.U.
KB = Kilo B.T.U. or 1000 B.T.U.
MB = Mega B.T.U. or 1,000,000 B.T.U.

This facilitates rating convector heaters, radiators and boilers in KB (kilobtu) under specific performance specifications, which is the same basis as has been used for expressing the heat loss from buildings.

Past practice has been to design for full maximum heat supply to the entire building continuously. Today the common practice, established by Harding and Willard, of designing for a maximum demand of 15-mile wind, 70° F. inside and 10° F. above the lowest record outside temperature, is acknowledged, in general, as good practice. Due to the fact that the outside surrounding temperatures are different for each side of the building at different times of the day and that the wind is ever changing in direction and intensity, there is a definite trend toward dividing the piping system into specific controllable zones.

Orifice distribution, therefore, is becoming more popular and more universally used as it permits reducing the steam supply to zones requiring less heat, and, at the same time, distributing the steam to all of the radiators in proportion to their size.

Zoning in general is classed under three different conditions of requirement for heat:

1—Exposures of building
2—Occupancy of zone
3—Buoyancy of air

Exposure zoning is to make possible the adjustment of the heat supplied to the requirements of the actual heat loss from the building on each side, according to the weather demand. The shady and windward sides require more heat than do the sunny and leeward sides. Also the shady and windward sides do not often require the full designed quantity of heat.

Occupational zoning is intended to permit the heating of stores on the first floor without heating the whole building. It also permits giving a portion of a building less heat from the heating system as the heat from illumination or power-driven machinery is supplied to the air in the room. A kilowatt-hour is equal to 3.412 KB (3412 B.T.U.) or close to the equivalent of what has been considered 15 sq. ft. of radiation. Many other cases of zoning come under this classification.

The fact that warm air within a building rises with a definite force on a cold day is well understood by building managers and operators. This upward flow effect has variously been called chimney effect, flue effect and buoyancy. On cold days the lower parts of many buildings are more difficult to heat and the upper portions are overheated, yet the full quantity of radiation is necessary to accomplish initial warming preparatory to daily occupancy.

Many new tall buildings are being designed with the exposure zones in tiers so that different amounts of heat can be supplied to the different sides and heights, according to the requirements for both exposure and buoyancy.

The general rule for pipe-size computation was creditably established by Donnelley probably over twenty years ago and was based on 1-oz. drop per 100 ft. of pipe, according to Unwin's formula. Orifice distribution has brought to light the fact that by this rule the same pipe may be too large for short runs and too small for long runs. With the more modern method of computing pipe sizes the most remote radiator receives, within practical limits, the same flow as is received by the nearest radiator.

Welding of piping systems permits practical stream-line designs that greatly reduce the frictional resistance to the flow of steam. This especially is true in the case of "torch bending" where the pipe is curved to fit in place on the job by means of heating it locally with the welding torch.

One very pronounced effect on distribution of steam is the revelation that steam in a vertical pipe decreases in weight more rapidly than the atmospheric air surrounding the pipe. With this in mind the observations reveal that the static steam (gauge) pressure within a vertical riser will be 1 oz. greater at the top of the riser for each 200 ft. of height. This, therefore, assists in overcoming the frictional resistance of the pipe itself in up-feed systems and retards the flow in down-feed systems. Up-feed systems, therefore, will probably become more popular and the down-feed designs will be limited to specific requirements.

Fig. 1. Domestic Stoker for Burning Anthracite Fuel Exclusively

Fig. 2. Screw-Feed Stoker Developed in the Far West for Domestic Installations

Fig. 3. Portable Type Stoker with Coal Feed Through Firedoor

# Developments in Coal-Burning Appliances

FIVE distinct developments have taken place in the burning of solid fuel in the past quarter-century. The first three of these, the development of the smokeless sectional boiler, changes in design of the magazine feed type boiler and the appearance of a boiler for the burning of by-product coke, properly belong in the history of the improvements of cast-iron and steel heating boilers.

There remain, however, two developments. By far the more important of the two is the adaptation of the stoker, used for 40 years in the power field, to the smaller heating installations. This adaptation has come about gradually and represents a slow broadening of the power stoker field to include smaller and smaller applications. The result has been that there are now over 20 stokers being manufactured for domestic, commercial and small industrial heating plants.

The fifth development has been the application of blowers to supply forced draft so that small-sized, and consequently cheap, coal can be burned. Buckwheat and screenings constitute 35% of the total anthracite production, and forced draft equipment has opened a large market for the disposal of such fuel.

Savings in fuel costs are thus made possible to the extent of 40%, and since the control of blowers used can be accomplished by a thermostat, a semi-automatic operation results.

Fully automatic operation with solid fuel is, so far, not possible, as the coal must be placed by hand in the hopper or magazine of the boiler or furnace. Nevertheless, appliances have been developed to give various degrees of automatic operation, so that they can run without attention for several days. To offset the slight

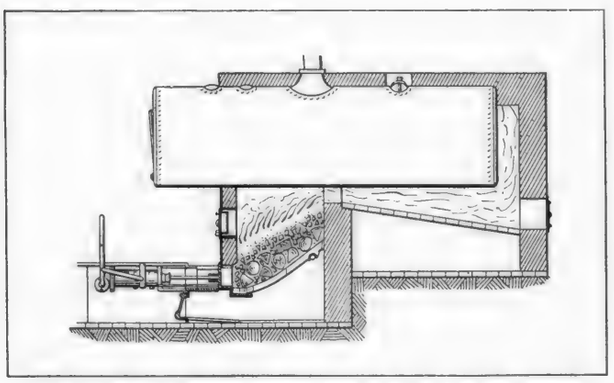


Fig. 4. Early Jones Stoker Used for Firing Wood

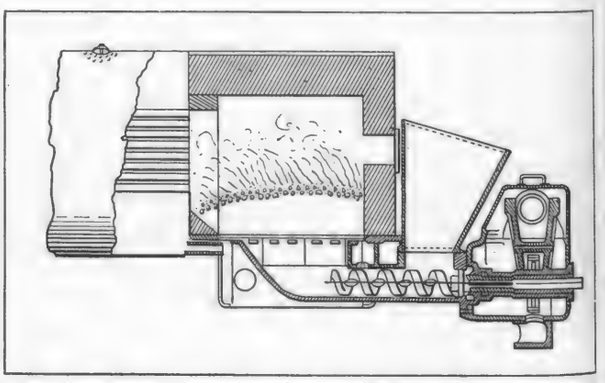


Fig. 5. The American— First Stoker to Use Screw Principle

disadvantage that the owner of these appliances must charge the fuel and remove the ashes occasionally, these devices have an important advantage over hand operation in that a considerable saving in fuel cost is possible, and unquestionably they do reduce the home-owner's labor.

Stokers in the power field are classified as chain grate, underfeed, and inclined grate, and these classifications apply to the domestic and moderate size commercial stokers, which are at present engaging the interest of the heating industry.

Underfeed stokers are descended from the old Jones stoker (Fig. 4) developed in the '80's. In this article in THE HEATING AND VENTILATING MAGAZINE, September, 1928, William D. Edwards told how this stoker was developed in a wood-burning section —Portland, Ore.—and how at the time of the World's Fair in Chicago, one of these stokers was brought to that city and used in coal-burning service.

In the Jones stoker a ram or plunger was used to force the coal or the wood into the firebox. The American, shown in Fig. 5, was one of the early types used in the power field and in this device the screw principle was utilized in order to avoid infringement on the Jones patents. The designs of the majority of domestic stokers used today are based on this screw feed principle.

A chain grate stoker is shown in Fig. 6. In this type coal is fed by gravity from hoppers at the front of the boiler onto an endless grate which passes over geared shafts at each end. The shaft slowly revolves, being driven by power, carrying the grate from the front of the boiler towards the rear. The speed of the chain, from 3 to 12 mi. per hr. is such that combustion will be complete by the time the chain passes over the rear sprocket and the ash falls to the ashpit below.

Fig. 6. Chain Grate Stoker Used in Commercial Sized Heating Plants

Fig. 7. Blower Adapted to Forced Draft for Small Heating Boiler

This stoker is fully automatic and will burn any grade of anthracite coal. It can be installed in low set boilers without excavating. However, it is adaptable only to commercial installations and cannot be used in the small domestic boilers or furnaces. The capacities range from 6000 to 28,000 sq. ft. of steam radiation, and it is made in numerous sizes to fit the particular installation to which it is to be applied.

The pioneer of domestic stokers, descended directly from the stoker shown in Fig. 4, is that shown in Fig. 2. This device utilizes the screw principle, the coal being conveyed from the hopper to the firebox by means of a spiral feed worm. Forced draft is supplied by a fan attached to the motor. The hopper holds 250 lbs. of coal. With this type of stoker, using the underfeeding feature, coal is preheated before entering the combustion zone and the volatile gases are distilled off and passed up to the top of the fire to be ignited and completely consumed.

As is usual with domestic stokers, this device is controlled by a thermostat, but once every 5 hrs., regardless of the temperature control, the

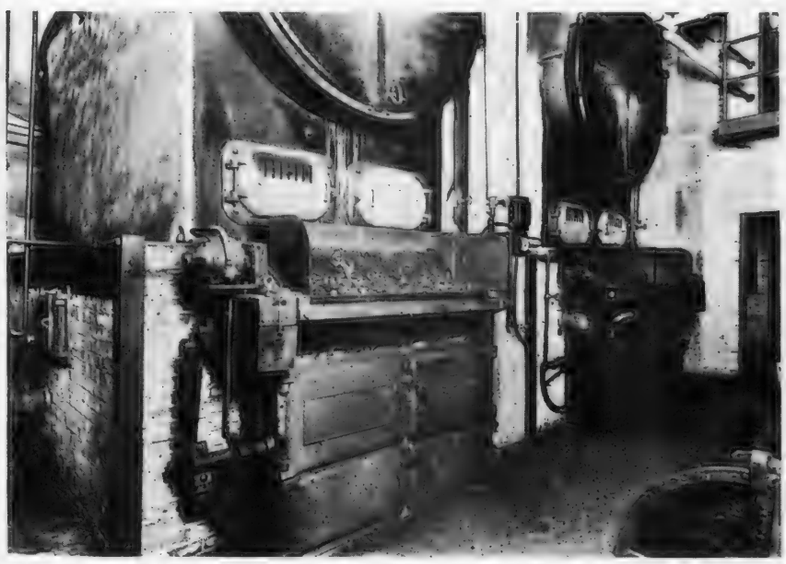


Fig. 8. Overfeed Stoker in Y.M.C.A. Building, Chicago

**Fig. 9. Underfeed Stoker in Chicago Hotel**

stoker is started and run for 5 min. to prevent the fire from going out in mild weather. In case any foreign substance should be introduced into the screw, a special key in the driving shaft would be sheared, so that no damage could be done to the screw. The air supplied to the fan can be controlled by adjusting the louvres on the fan inlet. The model shown is for installations of 580 to 800 sq. ft. of steam radiation or its equivalent; seven other models are made with capacities ranging from 1000 to 20,000 sq. ft. of steam radiation.

In Fig. 10 is shown the screw feed of another type of underfeed stoker. These stokers are available in six sizes, with fuel consumptions ranging from 75 lbs. to 900 lbs. of coal per hour and with loads from 4000 to 16,000 sq. ft. of steam radiation or its equivalent.

A recent development is incorporated in the design perfected by an Ohio manufacturer. The screw feed stoker is equipped with a dual control for the fuel and air, and the same mechanism that changes the rate of coal feed adjusts the air supply damper, automatically maintaining the fuel and air supply in proper relation. This stoker can be supplied in five sizes, with capacities from 4500 to 20,000 sq. ft. of steam radiation. The stoker shown in Fig. 9 has the advantage that in case any obstruction should follow the feed screw, it is not necessary to empty the hopper to remove the obstruction.

An example of the overfeed type stoker is shown in Fig. 8. Coal is fed from the front onto a stepped grate mechanism having two stationary and two movable grate sections. The movable steps or grates have a reciprocating action which causes the coal in the hopper to work down along to the ash plate. The whole mechanism is operated by a ½ H.P. motor. This appliance will burn up to 35 lbs. of non-smoking bituminous coal per hour per square foot of grate surface and a fuel bed of constant thickness is maintained.

An overfeed stoker for domestic uses was announced the latter part of May. Coal is placed in the hopper in the front of the boiler from which it is fed onto a coking plate by rams. From this plate the coal is pushed back by succeeding charges onto the upper end of the moving grate and gradually worked down until it reaches a stationary pipe where the last remaining combustibles are consumed, after which the ash falls into the ash can. Preheated air is used for combustion. The air for combustion is drawn from the space between the two walls of a double wall combustion chamber. This device is built in two sizes with capacities from 700 to 1000 sq. ft. of direct steam radiation or the equivalent in water radiation. Fig. 1 shows a stoker designed especially to burn anthracite. This device has been tested by an independent laboratory for the Anthracite Operators' Conference and has their approval. This device is not only automatic in the feeding of the coal, but also removes the ashes from the boiler and places them in a container on the outside of the heater. It has a wide distribution in the anthracite burning regions.

A stoker with some unusual features is shown in Fig. 3. A small mill grinds the coal which is then conveyed by a worm feed through the tube into the feed door of the firebox. The coal dropping from the mouth of the tube is spread evenly over the grate by a cone-shaped device in the firebox. The whole apparatus can be removed from the boiler or furnace and wheeled away if, for any reason, direct firing is desired.

Fig. 7 shows an installation of a blower adapted to the heating boiler for supplying forced draft. Like the stokers, such devices permit the use of small-sized coals and reduce operating costs, and they are considerably cheaper to install. However, their use has been confined to the anthracite districts. They are not competitors of stokers, for the stoker is more nearly a fully automatic appliance, and is designed for those who are willing to pay a few hundred dollars for lessening the burden of shoveling coal, adjusting drafts and regulating room temperatures.

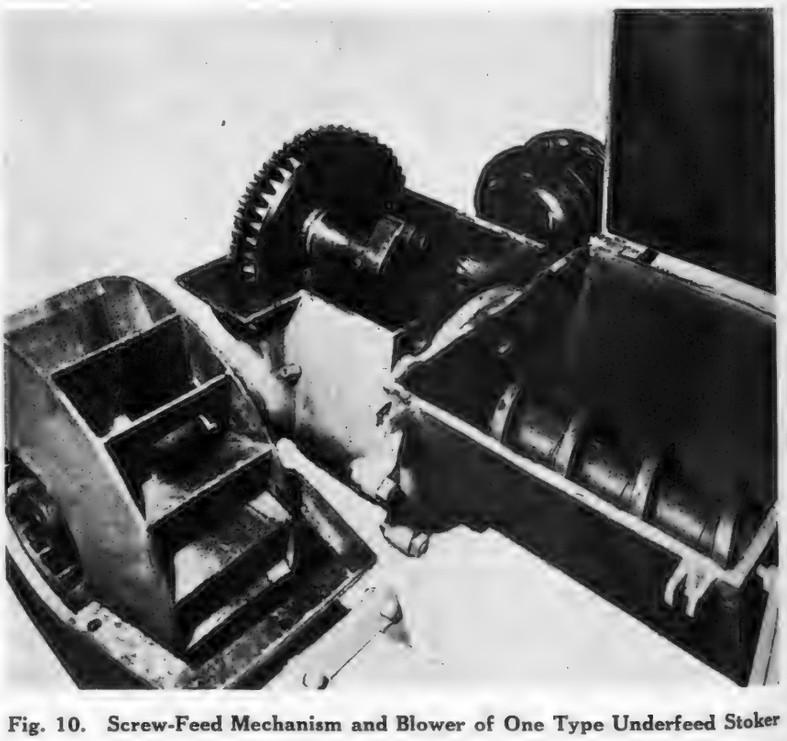


**Fig. 10. Screw-Feed Mechanism and Blower of One Type Underfeed Stoker**

# Frederic Tudor and the Development of Steam Heating

*by* **WALTER E. BARNES**

*Barnes & Jones*

**Frederic Tudor**
Originator of Vapor and Modulation Heating

THE history of heating in this country resembles the history of many other of the arts and sciences in that while the general chronological development is known, the exact dates when certain specific improvements or changes took place are unknown. And this applies particularly to steam heating and, to a lesser degree, to the development of vapor and vacuum systems.

It is known that about 1840, or shortly thereafter, Robert Briggs began to install water heating systems. About ten years later steam began to be used as the heating medium, instead of hot water. So, generally speaking, we can assume that about 1850, or, perhaps, a little later, the first steam heating systems were being installed.

Joseph Nason is credited with having been the first to use steam in the United States for warming buildings. Within the next seven or eight years many concerns began to manufacture steam heating apparatus, boilers, radiators and valves.

Of necessity, for many years the apparatus employed and the methods of installation were crude and inefficient. In 1877, over fifty years ago, John H. Mills brought out the overhead downfeed one-pipe system and at that time he said, regarding the efficient design of heating systems, that it consisted in so proportioning the supply and return pipes, "that there shall always be an equal pressure on both."

As late as 1883, Frederic Tudor wrote, "All systems up to the present time depend for successful working upon . . . . . the pressure in the apparatus, whether much or little, being equal in every part." At the same time he brought out the first modulation valve or "the fractional valve" as he termed it.

In this same year Mr. Tudor brought out the first vapor system which he called "The Differential System of Circulation," and referring to the one- and two-pipe systems in use at that time, he said, "There being no partial control, a moderated heat cannot be obtained."

He said, "My method of promoting the circulation—the differential system—consists in providing for a higher pressure in the distributing pipes than in the return pipes. There is thus produced a positive tendency of movement toward the latter, measured by the excess of pressure."

Tudor equipped each radiator with a fractional valve, so proportioned that when wide open it would admit to its particular radiator only as much steam as that radiator would condense under maximum operating conditions. His valve permitted a reduction of the supply of steam in any proportion less than the maximum, so that the heating capacity of the radiator could be adapted to the varying requirements of the weather or the feelings of individuals.

With Tudor's differential system no air valves were installed on the radiators, and the fractional supply valve was the only valve used in connection with each radiator.

While Tudor's system was a decided advance theoretically, practically it encountered several difficulties. However, as time went on, gradually he overcame these. In 1902, he brought out the first successful open return-line vapor system, as we know it today, the essential features of which were that the return side of the system be vented to the atmosphere and the installation of a thermostatic trap on the return from each radiator, thus insuring that the return side of the system would be free from steam or pressure at all times.

Meanwhile, progress in steam heating was being made in other directions. In 1882, Williams had secured a patent on a system employing a vacuum on the return side. Thermostatic valves had begun to be patented in the '50's and from then on.

Early in the '90's vacuum heating

systems, combining these two features, began to be marketed commercially. The developments since that time, through the first types of thermostatic return traps, then the float type of return trap and finally back to the thermostatic type, are well known to all.

And now another stage has been reached, the development of the orifice system. Tudor first brought out this idea and patented it in 1885. The work that is being done today is the practical application of his vision of forty years ago.

The one man who did more than all others toward the development of the present day vapor system was Frederic Tudor. Educated as a civil engineer, he became the foremost heating and ventilating engineer of his time. He supervised the design and installation of the heating and ventilating systems in many of the most prominent buildings erected in this country from 1880 to nearly 1900.

He first discovered the true principles governing the circulation of steam in heating systems and he invented many of the appliances used in heating today for both steam and hot water systems. He had vision and courage and he did ont hesitate to experiment to prove a theory. He has truly been called "The Father of Vapor Heating."

It is a long step from the steam heating plants of 1860, operating frequently under pressures of 60 lbs. to 70 lbs., to the present-day vapor systems with a few ounces on the supply and, perhaps, a vacuum of several inches on the return, and this without pumps.

If Frederic Tudor could see how the principles embodied in his first differential systems to give moderated heat, to use his terms, have been amplified and developed, he could not fail to realize that the work he did and the experiments he made have been of tremendous benefit to mankind.

# Notes of a Pioneer in Air Conditioning

*by* **WALTER L. FLEISHER**

*Vice-President, Cooling and Air Conditioning Corporation*

BACK in 1903, when I moved to New York, heating and ventilation was progressing on more or less of a rule-of-thumb basis. Four changes of air per hour and 1 sq. ft. of direct radiation per 40 cu. ft. of contents were good rules to follow for an average room. When the top floor of a building didn't heat, the advice was given to take the radiation out of the draft. No one had even thought of evolving a method of determining transmission losses through various complex enclosures. In fact, there weren't many complex enclosures to figure. Concrete was hardly known as a building material, and brick, varying in thickness from 9 in. up to 48 in., was the common wall construction. The fight in those days was over the basic patents of vacuum heating.

When, in 1908, I received an order to ventilate the United Cigar Manufaturing Company's factory — now the General Cigar Company—at 52nd Street and Second Avenue, New York, and in the outlet of the fan I put perforated steam pipes to supply moisture so that the tobacco might not dry out, I believe I was pioneering in tobacco conditioning. Then, when, in 1911, I installed an air washer in the Folies-Bergere Theatre—now the Fulton Theatre,—so that cooling could be accomplished, I think I installed the first modern theatre cooling system. It wasn't much of a success and the theatre failed anyway because it was 15 years ahead of its time, but the same Jesse Lasky, whose name is so prominent in Paramount and Publix today, was the sponsor of that theatre. I know that I had some difficulty in getting an air washer for the job and the Thomas washer I finally obtained, had very little theory or data as a basis for its design. We were able, however, to cool about 7° below outdoors, but only the inefficiency of the apparatus saved the installation from being unbearable.

From 1905 I was called in by many owners whenever a special ventilation problem was involved. Even as far back as 1903 I installed in a large Fifth Avenue residence an automatically-controlled complete air-conditioning apparatus as an adjunct to a hot water system.

The country has advanced in twenty-five years—mechanically and from a machine-manufacturing standpoint—faster than our knowledge of how to apply basic physical equations. Prosperity, the necessity for speed and uniform production, luxury and comfort have wrought wonders in an application of basic facts to practical application. A few of us who pioneered have clung to our faith and our first loves and today are visualizing some of the results. In another twenty-five years what only a few see and understand today will be common knowledge and the pioneer will have discarded all of this for further and different fields.

However, there is only cause for satisfaction and encouragement in the marvelous development of air conditioning today. If we can only point to isolated cases of air conditioning back in the early days of this century, today air conditioning is a common and necessary adjunct of so many industries that it is almost impossible to enumerate them. Practically no modern bakery, candy factory, cigar manufacturing, rayon or chewing gum plant is built or equipped without air conditioning being almost a primary consideration.

The use of air conditioning in the cooling of theatres has brought home to the mind of the average person what air conditioning can accomplish and what it does accomplish. With the very large percentage of our citizens visiting air-cooled theatres, their minds are now tending towards the possibility of simple air conditioning and cooling in their homes. The next twenty-five years probably holds a greater future for humidifying and cooling in the home than any other branch of the art.

# Air Conditioning—Its Phenomenal Development

*by* **WILLIS H. CARRIER**

Willis H. Carrier

RECOLLECTION, history, looking backward, fulfill two purposes in the human consciousness. We muse on the things that have passed, sometimes with satisfaction, sometimes with regret, and apparently we do profit by the experience of the past; how else could we progress?

I don't feel that I have yet reached that period in life when I can sit back and contemplate the work that has been done with any particular comfort. With the increasing intensity of developments and business activities in general, it is only occasionally that I have time to think of the incidents and steps which have led to the present state of development in the field of thermal engineering.

No doubt, in years to come, I shall be forced to step aside and shall then have time to look back over the road which I have travelled with so many men in our profession. When that day comes, no doubt the pictures of the past will become more clear and will occupy a more important place in my thoughts.

Since, however, you have stopped me to ask some of my recollections pertaining to the development of air conditioning or, more broadly, thermal engineering, it is interesting to look back only a little more than a quarter of a century and be reminded that at that time air conditioning was only the crudest form of ventilation.

Humidification, when attempted, usually was accomplished by the sprinkling of floors or the ejection of steam directly into rooms in which it was desired to raise the moisture content.

Instruments for measuring the moisture content of the air were crude, and the reference data upon which determinations were based were comparatively inaccurate and covered only a limited range. Such control of humidity as was attempted was accomplished by hand, the opening or closing of valves. Regulation of temperature had already begun to be accomplished by automatic instruments. Even if there had been automatic humidity regulation, instruments—the means for proper humidification—had not yet been developed.

In the matter of dehumidification or cooling of the air the art was in an equally unsatisfactory and undeveloped state. There had been a number of applications in a limited way in which air was cooled by passing over ammonia expansion coils or cold brine coils by which the air was cooled sufficiently to deposit a portion of its moisture on the pipes as frost. Such systems were cumbersome, dirty, and offered increasing resistance to the air flow, as frost and dirt collected on the pipes. Again, automatic and fixed control was out of the question.

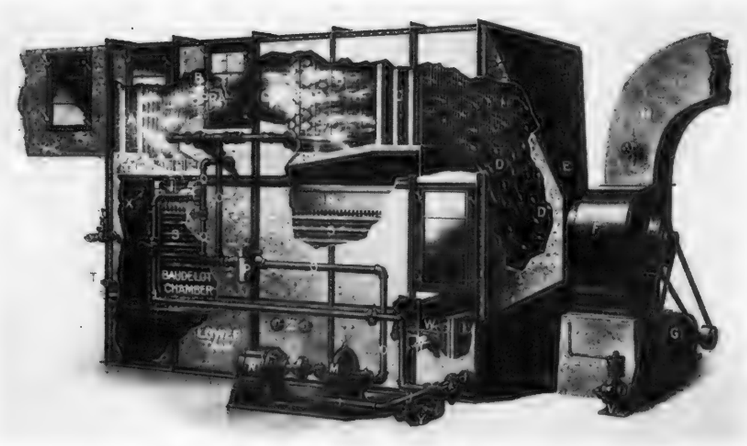
Air washing had entered into its early stages of development. I believe the first practical unit was the Acme air washer, invented and manufactured by Thomas of Chicago. This marked a real advance in ventilating systems. It was built primarily, however, as an air washer and the humidification which it gave merely was incidental. No attempts were made to effect control by the modification of water temperature nor to give complete saturation.

It is interesting to look back upon the incidents of any one's career and see how accidental occurrences may become vital factors affecting one's future activities and often a whole industry.

In 1902 the late Walter S. Timmis, known to almost every one in our field of engineering, came upon a problem in a lithographing plant in Brooklyn in which the process of lithographing during the extreme summer conditions would obviously be improved, both in quality and efficiency, by reducing, or at least controlling, the moisture content of the air. He took this problem to J. I. Lyle, then manager of the new office of the Buffalo Forge Company. Mr. Lyle submitted the problem to the home office where, a year before, upon leaving college, I had taken a job in the Engineering Department and was assigned primarily to research and development.

Mr. Timmis suggested that we in-

As related to D. C. Lindsay, physicist, Carrier Engineering Corporation.




**An Early Self Contained Dehumidifier**

The direct expansion Baudelot coils are located on the tank beneath the spray chamber

vestigate the moisture-absorbing properties of a solution of calcium chloride brine. The experiment originally followed these lines, in which I was assisted by E. T. Murphy and R. W. Pryor, Jr., both of whom now are prominent heating and ventilating engineers. Our work, when accomplished, established very definitely the moisture-absorbing properties of this solution, but only served to point out many objections for its commercial use, among which were the liberation of the latent heat of the water absorbed, the entrainment of brine, with resulting undesirable odors and corrosive action.

An investigation also was conducted in which brine and cold water were circulated through pipe coils over which the air was passed. During these experiments it was observed that as dehumidification was taking place, the air was in contact with water on the pipe surfaces; in other words, we had the apparent paradox of reducing the moisture in air by bringing it into contact with moisture. Of course, the explanation was simple. The temperature of this water was below the dew-point or condensation temperature of the entering air. Why should we not, then, spray the cold water into the air stream, thus increasing the surface of contact and reducing the resistance to air flow.

Developments followed rapidly. A satisfactory spray nozzle was discovered. The next step was the development of eliminator plates which prevented the entrainment of unevaporated particles of moisture with the air stream after leaving the spray chamber.

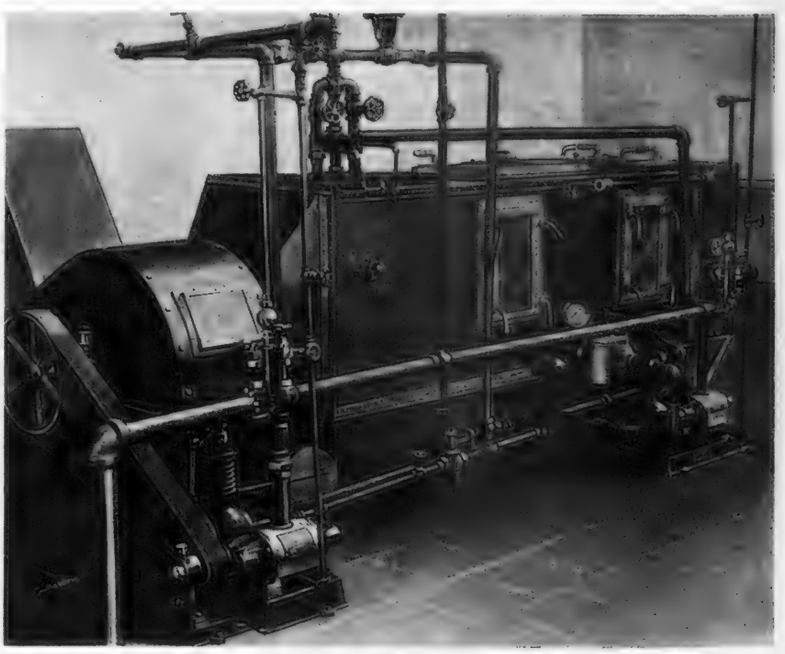
These early experiments, prompted by a problem based upon a comparatively small printing establishment, started the trend of investigation through which many of the fundamental laws of evaporation, of humidity control and of heat transfer were established and are in use today as the basis of air-conditioning practice.

About 1905, the company with which I was then associated undertook the commercial manufacture of air washers, many features of the design of which had been developed during these experiments which I have just described. Incidental to this development the dew-point control was devised which consisted of a thermostat placed at the connection between the fan and the air washer. This thermostat was designed to control the temperature of saturation of the air; that is, its dew-point, by controlling the temperature of the water delivered from the spray nozzles, a practice generally in use today. This led to a practical method for controlling the relative humidity within a room to which the conditioned air was delivered. The procedure was simple. If the dew-point is fixed at the spray chamber and the temperature of the air controlled within the room, any desired relative humidity may be established.

In 1905 the first air washer or central station humidifier was installed in a textile mill near Charlottle, N. C. Early experience showed the defects and it was only a few years until central station humidifiers and air-conditioning equipment became common in textile mills throughout the South and in New England.

We can pause here to say that air conditioning and controlled humidification have counteracted unfavorable climatic conditions in the South and have been highly responsible for the vast textile manufacturing development in that region during the past two decades.

All of these early experiences in the laboratory and in practical application brought to our attention fundamental relationships and natural laws which we investigated and finally succeeded in rationalizing on a mathematical basis. For instance,

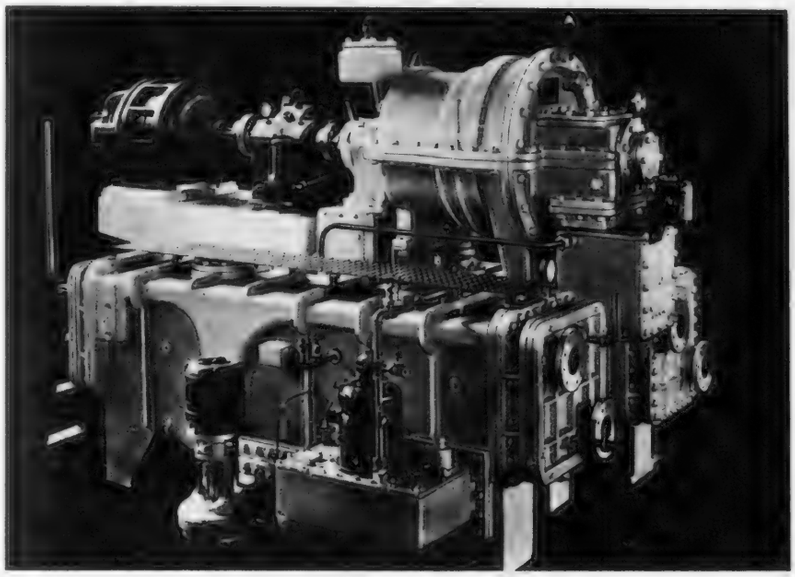


**An Early Example of the Central Station Humidifier**

it was noticed that the saturation temperature of air, when passed through a chamber in which the spray water was simply recirculated, was exactly the same as the wet-bulb temperature of the entering air. This same fact subsequently was observed in tunnels in which wet material was being dried. Under these conditions it was noted that the wet-bulb temperature remained essentially constant throughout the length of the tunnel while the dry-bulb temperature of the air was being reduced, due to the absorption of sensible heat by evaporation, and coincidentally the dew-point was increasing.

An analysis of this showed that the total heat of the air remained constant throughout such a saturation process and that the wet-bulb temperature could be taken under any condition as a measure of the total heat of the air. These facts were rationalized and formulated, establishing the basis for the Psychrometric Chart, now in general use. The formulae, with other derivations, and the chart were presented by me in a paper before the American Society of Mechanical Engineers in 1911.

Stewart W. Cramer, of Charlotte, North Carolina, independently discovered this same law relating to the wet-bulb when he found that the air leaving his heated humidifiers was the same temperature as the wet-bulb of the room. He utilized this principle in 1906 in the wet- and dry-bulb hygrostat upon which he obtained a basic patent.



**A Carrier Centrifugal Refrigeration Unit**

On the basis of these early fundamental discoveries and developments the science of air conditioning has grown. With a little educational and sales effort it did not take manufacturers in many lines long to discover that this new science could be applied to great advantage in their industry.

The list of distinct industries wherein air conditioning has now been applied numbers well over a hundred, and the number of installations may be counted in thousands.

Printers and lithographers, at whose doors we may almost lay the origin of air conditioning in its modern practice, have been slow to seize upon the many advantages which are offered. This, however, is due largely to the fact that the industry has been scattered and the majority of shops have been small. However, this is changing and an increasing number of progressive printers and lithographers are adopting weather control to avoid the many delays and defects which have affected the quality and efficiency of their production.

No modern textile mill is without some form of humidification or air conditioning. Cigar and cigarette factories also are almost universally equipped, otherwise they would find it impossible to accomplish the high rate of machine production through which more than a hundred billion cigarettes and some seventeen billion cigars are produced annually in the United States.

Rayon, a new but powerful industry, is dependent in almost every one of its processes upon accurate automatic control of temperature and humidity.

Modern confectionery plants now utilize air conditioning to maintain cool non-humid conditions within the manufacturing, packing and storage rooms. Comparatively uniform schedules of production are followed throughout the year. A high-grade and efficient staff of employees is re-

**A Modern Air Conditioning Installation in the U. S. Capitol**

A portion of the dehumidifiers, fans and duct systems which provide conditions of healthful comfort in the chamber of the House of Representatives

**Unit Air Conditioner Which Makes Complete Air Conditioning Available to Small Manufacturers and in Old Buildings**

tained. Extra employment for rush seasons is avoided. Under controlled air conditions confections may be made and stored in August for the holiday rush.

Our progress during the past sixteen years has consisted primarily of development and perfection of equipment to accomplish the results indicated by the early investigations. The early installations of air-conditioning equipment were comprised primarily of pieces of apparatus then available and frequently developed for another purpose. The fan and blower equipment of today is decidedly improved.

Recent years have seen the development of light-weight extended-surface non-corrosive heaters, which respond quickly to automatic control, which are easy to erect and to make an integral part of a metal duct system. Control instruments have been improved and are now very dependable and almost foolproof.

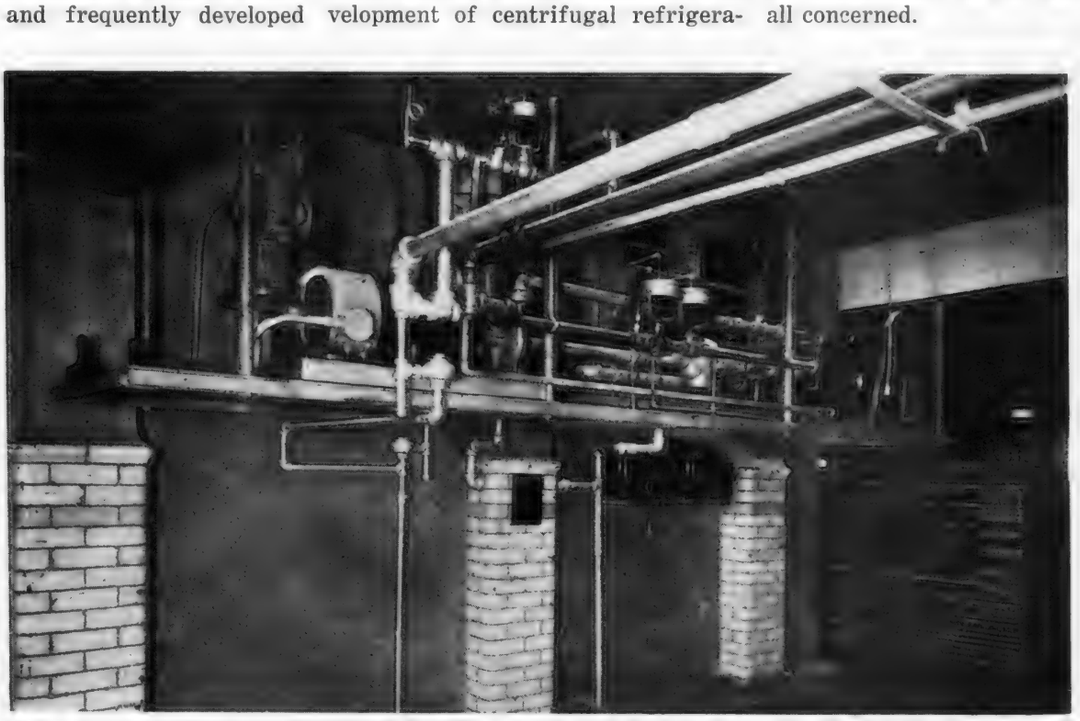
Much has been learned relative to the distribution of air and to the construction of metal duct systems. Whatever air condition may be established within the apparatus, its purpose is not served unless properly distributed within the space to be conditioned. This, perhaps, is one of the most important factors in present-day air-conditioning practice, and it is here that the inexperienced or *rule-of-thumb* builder is most apt to fail in the construction of a system.

Refrigeration equipment which must be used in conjunction with air-conditioning systems, wherever cooling and dehumidification are to be accomplished, has been greatly improved. Though I do not wish to dwell upon or emphasize the accomplishments of myself and my associates, it was this requirement for a safe, compact, flexible refrigeration unit adaptable to an air-conditioning system which brought about the development of centrifugal refrigeration, now widely in use in conjunction with the modern air-conditioning plants in theatres and public and industrial buildings, here and abroad.

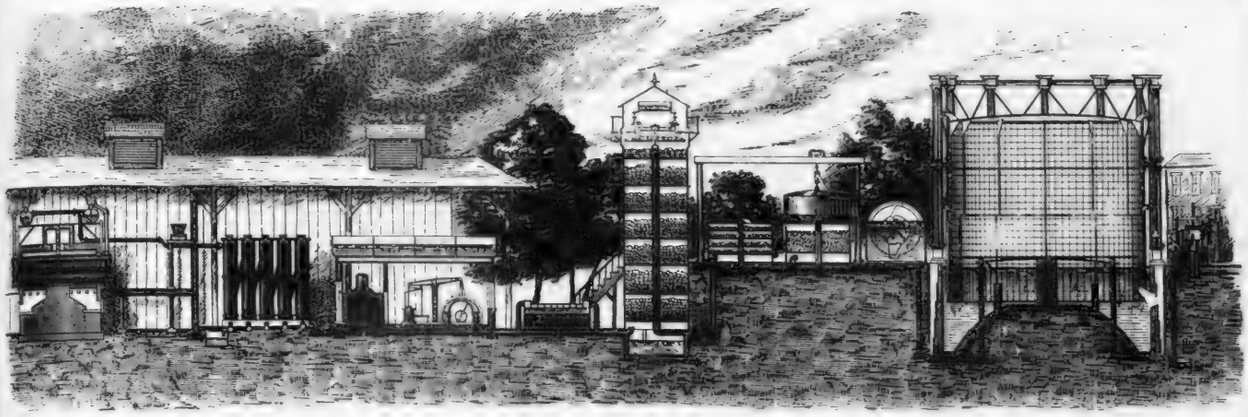
When we venture to look forward we are quite as likely to underestimate the possibilities of the future as we are to enlarge and place too much importance upon that which is past. We can only say, now, that air conditioning has become the useful and often indispensable servant of manufacturers in hundreds of industries. In the past few years these developments have been seized upon to create conditions of healthful comfort in theatres, offices, hotels, and stores, and, with the present growing interest of the public, it seems evident that merely the surface has been scratched.

We now look forward to the complete air-conditioning system in the home, including cooling and dehumidification in the summer as well as the furnishing of clean, properly humidified and tempered air during the winter.

No individual or no firm can take credit for all or any large part of these developments. They are the natural outgrowth of busy, intelligent minds aiming toward improvement and attempting to develop the appeal of air conditioning to engineers, architects, contractors and owners so that the standards of the industry are not lowered to the detriment of all concerned.



**Compact Automatically-Controlled Air Conditioning Equipment in Baking Plant**



(Permission of the Commissioner of Patents)

**Cross Section of Complete Gas Works of 1884**

# 500 Heating Rates Mark Gas Industry's Progress

*by* **EUGENE D. MILENER**

*American Gas Association*

LET us consider the typical American home in the first stages of its development. Wherever it was located there were six extremely important services upon which it depended largely for its existence. These six services were somewhat alike, because the rendering of each one required extensive storage of some material in or about the home, in addition to the daily handling of this material. These included:

Water—stored in wells or cisterns and conveyed by pumping or carrying in buckets.

Cooking—Wood or coal stored in quantities and fire kindled for each meal.

Lighting—Oil stored in large cans, with lamps "trimmed" every day.

Hot Water—Wood or coal stored and fire made from time to time.

Refrigeration—Ice bought daily and chopped into small pieces as needed.

House Heating—Wood or coal stored in large quantities and fires kept burning day and night, seven months every year.

That is the picture of the six vital services required in every American home under conditions existing not so many years ago.

What has happened as the home has developed? The first five of these services now are supplied automatically in all new modern homes and in most of the older homes. In other words, it generally is taken for granted that water should flow in from a distant reservoir through a pipe, that gas should freely flow from a distant holder when food is to be cooked, that current from the power house should furnish a flood of light when it gets dark, that gas from the street mains should heat water as fast as it runs from the spigot, and that gas or electricity flowing through a meter should be used to cool the refrigerator and furnish dainty ice cubes as needed. The development of the home has depended largely upon shifting these five services to sources far removed from the house and operated and controlled sometimes miles away.

Is the home-owner going to continue to store fuel in his house and have the care of a fire every day for seven months each year? Or is the sixth and last of these services to follow the lead of the other five? I believe it is inevitable that house-heating will follow the course of the other five because I feel sure the home-owner, in the future, will insist on the convenience of gas heat just as he has insisted on the other five services.

Gas house-heating is emerging from its swaddling clothes and now is available in nearly every section of the country. The development period has been one of tremendous importance to the heating industry for many reasons, but chiefly because it represents the entrance into the heating field, for the first time, of large, firmly-established, progressive, amply-financed, state-regulated, public utility companies.

The gas companies, many of them with records of over a century of uninterrupted public service, presented something new to the home-owner and that was a complete heating service. That service is given first in a consulting capacity during planning and construction of the home and later by furnishing an uninterrupted supply of gas of uniform quality, supplemented by expert maintenance as long as the house stands.

Gas Conversion Unit Applied to Coal Boiler

And the gas companies are the only organizations that are in a position continuously to render this complete heating service and accept the immense responsibility which naturally it entails.

The development of gas heating service was not a hit-and-miss application of burners into boilers designed for crude fuels. Quite the contrary; it is the result of years of painstaking research supported by gas companies and gas boiler and furnace manufacturers throughout the country.

Manufactured-gas companies entered the house-heating field about 1915. It generally is recognized that the city of Baltimore was the first to enjoy this luxury on a large scale. Other cities early in the field were St. Louis, Portland, Chicago, and New York.

The great impetus which the movement received in Baltimore was from the establishment of differential rates in 1915, which brought the cost of heating entire buildings with gas down to a reasonable percentage over the cost of heating with solid fuels. Since that time the wisdom of making special gas rates for house-heating has generally been recognized and today there are nearly 500 special house-heating rates in effect.

A most intensive development of house-heating with gas has extended over the last decade. During that time experience had to be gained in handling the many details incident to maintaining a 24-hour service. In addition, many questions of policy had to be decided and tested out. One readily can understand the magnitude of a job that undertakes to supply uninterrupted day and night heating service to thousands of buildings—city, suburban and even farmhouses.

For over one hundred years it has been the spirit of gas men that the service shall not fail, no matter how trying the conditions. That spirit has been maintained for generations and it is now being applied to the minutest detail of servicing the customer's gas boiler and control equipment.

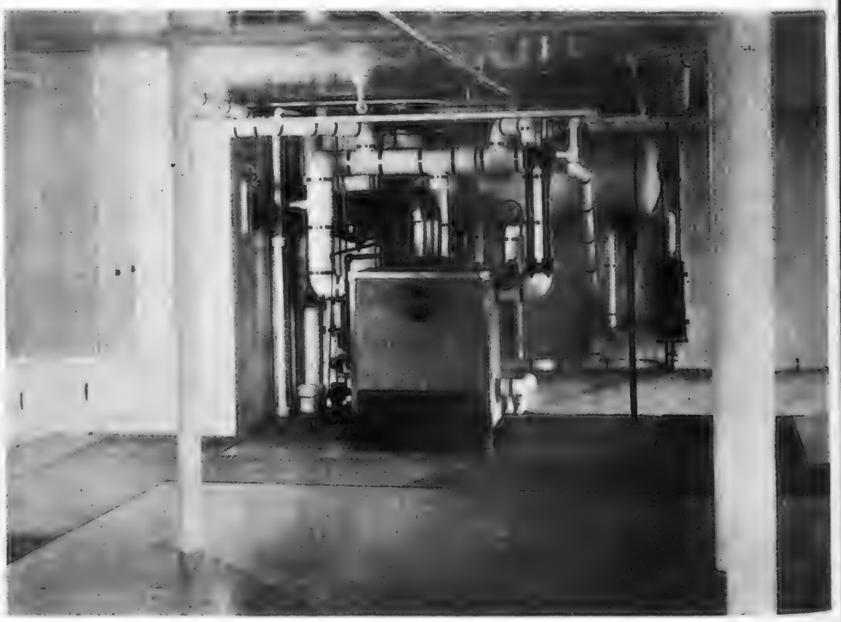
One of the finest movements toward putting automatic house heating on a permanently high plane was the preparation of "Approval Requirements for Central House-Heating Gas Appliances" by the American Gas Association and the insistence of the association that all boilers and furnaces shall be tested under the "Requirements." This assures the public and the heating trade of equipment that is a guarantee of compliance with basic national requirements of safety.

House-heating with gas has become standardized to a remarkable degree. Its reliability is a tribute to years of patient research on the part of those who supply the gas and service the equipment, as well as to those who offer such reliable boilers, furnaces and controls.

With the unprecedentedly wide distribution of natural gas and the great number of cities offering attractive house-heating rates for manufactured gas, this method of completely automatic house-heating is on a solid foundation. There are a number of cities served with natural gas that no longer have a single smokestack, either domestic or commercial.

In many large cities serving manufactured gas, as much as 7% to 10% of the total yearly gas output is now being sold for central house-heating plants, including residential, commercial, and industrial buildings.

Gas house-heating has played a prominent part in the new competition in the heating field—that is, the competition between solid fuels and completely automatic, semi-automatic and non-automatic heat. But it has done more than that. It has set the pace for better, cleaner basements, and it also has set the pace in building construction that has opened the field for wall and ceiling insulation. These two factors materially have affected architecture. There are many other basic living conditions affected. For instance, all materials used in gas making are delivered by boat or train and all gas is delivered noiselessly underground. There are no ashes to remove. Who can tell how great the benefits to traffic relief will be from these facts when 25% or 30% of the houses in congested cities are heated with gas?



Cleanliness Possible with Gas-Fired Equipment Reflected in this Installation

# The Evolution of Light-Weight Heating Surface

*by* **L. C. SOULE**

*Secretary and Chief Engineer, Aerofin Corporation*

L. C. Soule

AS my old friend and associate, John Hale, would say, "way back when" fan engineering was regarded by engineers very much as alchemy is regarded by chemists, a fan system heater was a ponderous thing unaffectionately called a "pipe coil." But it was no "pipe" to transport, erect, encase and otherwise install these fellows—rather was it a very weighty matter indeed.

Then, as time went on, a surface made entirely of cast-iron was introduced and called a "blast heater." Up until six or seven years ago, a mere fraction of a second in James Harvey Robinson's 50-year cycle representing man's progress during the last 500,000 years, pipe-coil and cast-iron "radiation" was the only surface available to the architect or engineer.

That it should have been, and still is, called "radiation" indicates the state of the art at that time, since it performs less than 1% of its work by this process—the other 99% plus by conduction, of course.

Then such men as Willis Carrier, Fred Still, J. F. G. Miller, E. B. Freeman, H. W. Wendt, C. A. Booth and J. I. Lyle, began to make the treatment of air an accurate science—created fan engineering.

As this new field of engineering developed, fan engineers more and more realized the imperative need of a heat-surface facilely adaptable, easily handled and installed, light and compact, built, preferably, of non-ferrous materials having a high coefficient of conductivity.

As a mere modest inventor, I spent years endeavoring to find someone who did not question my sanity and who was willing to listen to my new-fangled ideas. I think, now, that it simply sounded too good to be true, as the saying goes.

But finally I did find Willis Carrier and J. I. Lyle. They listened—and believed. Together we went through the throes of development and then, in 1923, after countless trials (of heaters and ourselves), we offered fan engineers the first standardized, non-ferrous, light-weight, compact, *encased* fan system heat-surface.

They seemed to be waiting for it and Mr. Lyle's business genius provided immediate sales facilities which resulted in rapid and wide distribution.

Fig. 1. Low-Pressure Aerofin on Standard Steel Supporting Legs

The first heat-surface we offered was unique in several ways, but even more than its remarkable lightness and compactness was it hailed because of its standardized integral casing, a development which, at one stroke, removed the most bothersome factor in the whole business, eliminating the slow, troublesome and usually profit-taking job of casing after erection.

At first the units were designed for pressures up to 50 lbs. gauge, but almost at once fan engineers, architects and heating contractors demanded units designed for higher pressures.

A few years later we introduced two other types, one for 150 lbs., the other for 350 lbs., service. Both the latter types are entirely distinct in construction but embody all the ex-

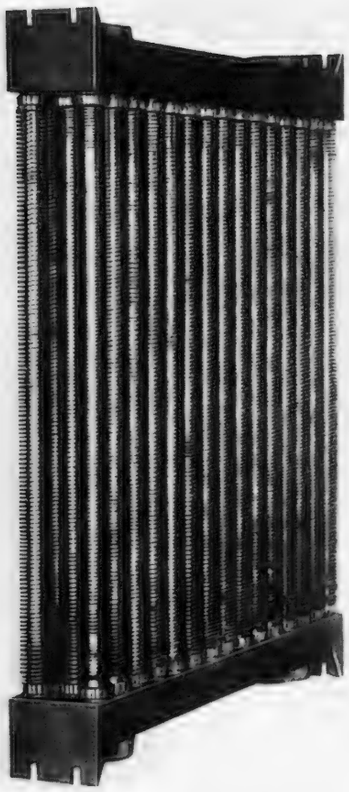


Fig. 2. Arcoblast Heating Surface

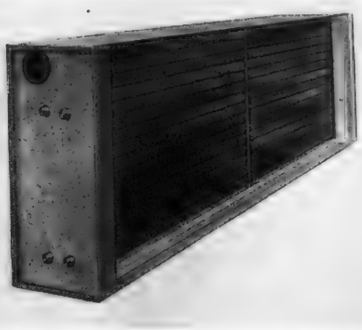


Fig. 3. Arcoblast Encased Heater

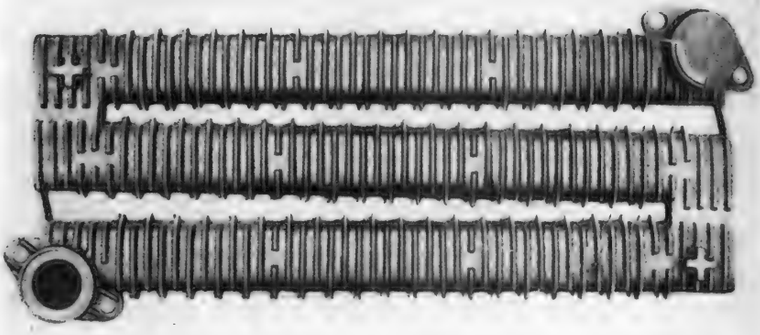


Fig. 4. Early Type of Extended Surface Heating Coil

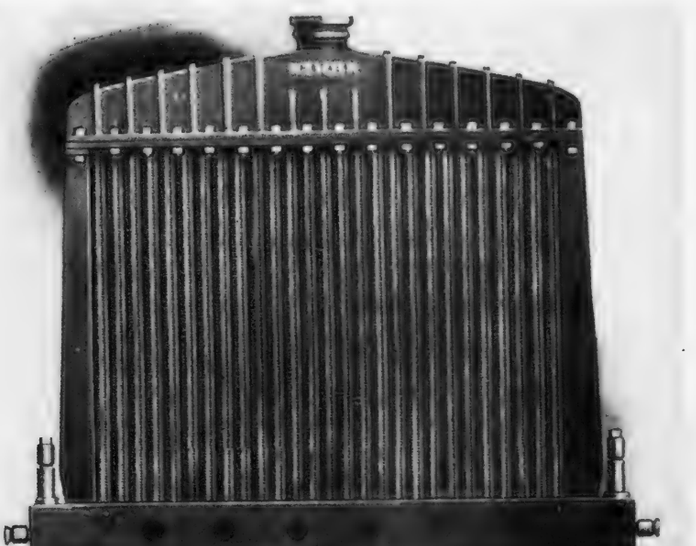


Fig. 5. Copper Tubes with Crimped Copper Ribbon Used for Truck Radiator

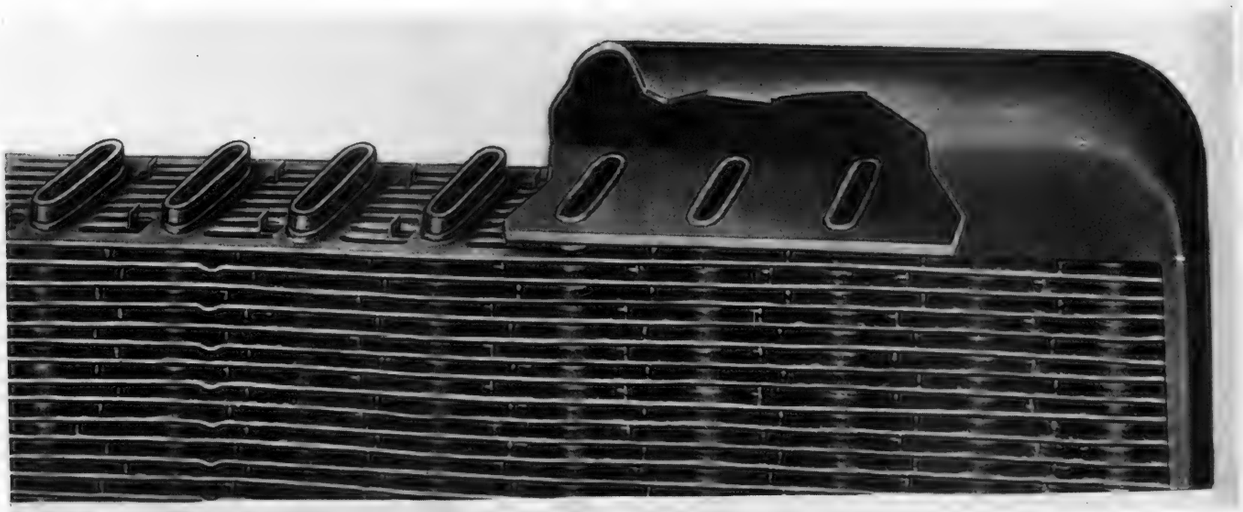
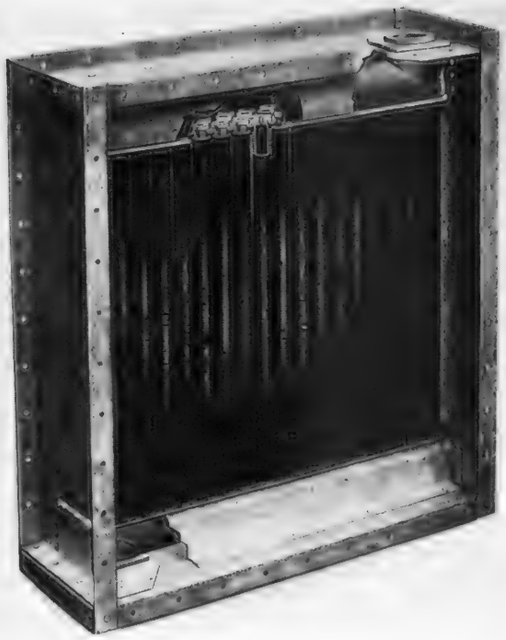


Fig. 6. Heating Surface Used in Comet Unit Heaters



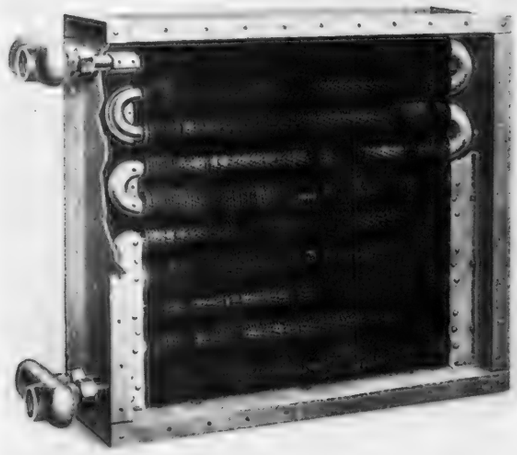


Fig. 7. Section of High-Pressure Aerofin, Showing Elbows and Header Connections

Fig. 8. (left) Section of Low-Pressure Aerofin, Showing Connections at Headers

perience gained from the pioneer work with the original type, employing the same extended surface, metallically bonded. And throughout the whole development the principle of standardization was followed rigidly. Hence all three types are cased alike and otherwise standardized.

Perhaps the most interesting developments of this work, not only at the very beginning, but consistently since that time, have arisen, not from the many problems involved in the design and construction of the surface itself, but from those concerned with its application.

The lightness and compactness of the new surface permitted architectural and engineering design previously impossible and wrought so many advances in practice that the word "revolutionary," for once, may be employed without exaggeration.

## Light-Weight Heating Surface Permits Overhead Suspension

To begin with, the lightness of non-ferrous surface eliminated the need of foundations or building reinforcement, permitting the use of standardized die-stamped steel legs for floor installation and allowing overhead, out-of-the-way suspension from ordinary building members.

The compactness permitted snug installation in otherwise useless corners and relieved the architect or engineer of limitations in cases where weight was a factor.

Transcending the importance, from a commercial standpoint, of this heat surface was the fact that its development so greatly broadened and enlarged the whole scope of fan engineering, of architectural and building practice. There has been many times greater advance in fan engineering, and in the rapidly-widening practice of air conditioning during the past five years of this quarter century, than during the prior twenty years. To an important degree, this has been inspired and made possible by light-weight, non-corrosive, heat-surface, not only when used in fan system work, but as the heart of the unit heater, which has entirely revolutionized space heating practice throughout the world.

If light-weight surface had been used for the unit heater alone it would have constituted the greatest advance in heating practice during the quarter century this issue of THE HEATING AND VENTILATING MAGAZINE is commemorating. But the almost instantaneous acceptance of light-weight surface for general fan system work has advanced the whole scope of fan engineering.

It is interesting to reminisce for a moment, to compare present practice with that of a quarter-century ago, to consider also the advance in knowledge as well as equipment.

The vertical return-bend pipe coils of yesterday presented so many problems of steam circulation and condensation removal that many adopted the mitre coil. It then was found that, while the mitre coil afforded better circulation and drainage, it short-circuited and many of the pipes received little or no steam at all. The principle of the restrictive orifice, now used in light-weight surface to insure equal distribution of steam in every tube, was then unknown.

## Cast Iron Radiation for Hot Blast Surface Dominated Field for Twenty Years

Cast-iron "radiation" for "blast" service was introduced in 1908. It embodied, in some measure, the principle of extended surface. Its maximum allowable pressure was 40 lbs. It corresponded in compactness per degree-rise with the pipe coil while its weight was somewhat greater.

From 1915 to 1918, I experimented constantly in an effort to develop a more effective application of the extended surface principle. One of the heaters designed in the early stages of the work is shown in Fig. 4. It weighed less per square foot and afforded a higher efficiency, but was not widely used.

As soon as the principle of the extended surface became clear I was struck with the possibility of using a metal having a higher coefficient of heat conductivity than iron and weighing less, as well. Soon I tested a truck radiator (Fig. 5) embodying a series of copper tubes carrying a

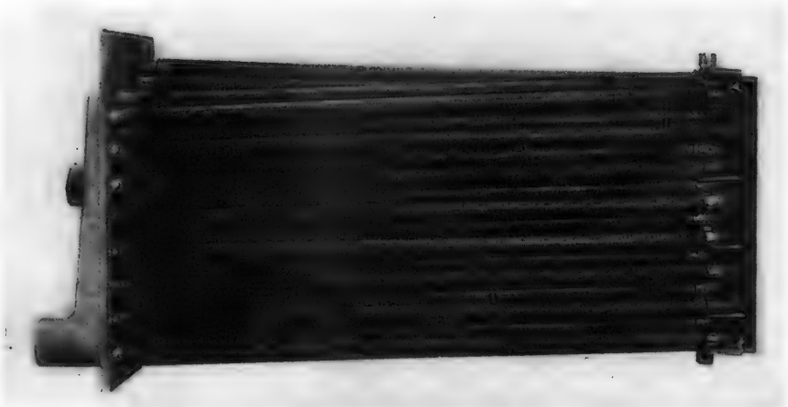


Fig. 9. Superfin Indirect Blast Radiation

helix of crimped copper ribbon, metallically bonded to the tube by means of solder.* At once the idea of light-weight, non-ferrous surface was born. I found that truck radiator more efficient and lighter in weight than any other heat-surface the world had ever known!

Then five more years of hard, sometimes almost despairing, work, and the first specifically-designed light-weight non-ferrous fan system heat-surface was ready. During the latter part of this period I had the great advantage springing from the generous assistance and sustaining confidence of Willis Carrier and J. I. Lyle.

The first unit wasn't perfect but it was such an achievement that the industry overlooked its minor imperfections, while we concerned ourselves with these first, last and unceasingly. Soon they were eradicated and the new day of fan engineering had dawned brilliantly.

Knowing that the new surface would present extraordinary piping problems, many times as complicated as those which were encountered by the first cast-iron "radiation" in its infancy, we realized the necessity for publishing accurate piping diagrams at the very beginning. Now diagrams are available covering almost every conceivable application and system.

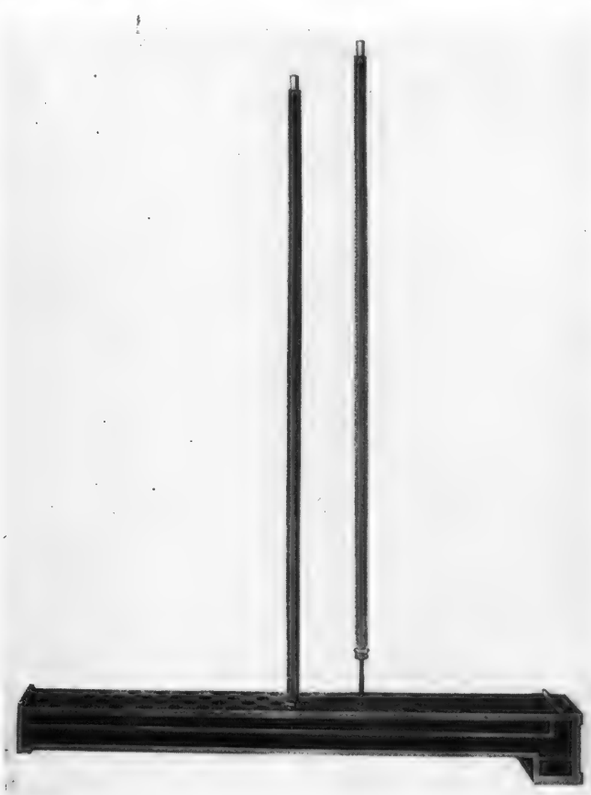
Through tests of the various auxiliaries required in piping, ways were found to avoid the use of traps unsuited to the extremely rapid condensation of light-weight copper heat-surface.

This is enough, I hope, to show why we're proud we've lived this quarter-century with you, and have had the opportunity of contributing somewhat to the very extraordinary advances which it has witnessed.

*Solder is used, in our product at least, as a means of effecting a steam joint. The solder serves as a metallic bond between the extended and prime surface.

## Living Quarters In Steam Pipe Tunnels

SEWER dwellers of Paris have their prototypes in Manhattan —men and boys who make their homes in the tunnels through which steam pipes conduct heat from central power plants to office buildings. These Gotham moles are familiar with the location of entrances to the tunnels, and once down in the tunnel it is difficult to discover them. Not long ago, the police picked up a youth who was exceedingly vague as to his place of abode, but he finally stated that he lived "down in the tunnel." Under a bit of questioning, he said that the tunnel had been his home for more than three years, during which time he had performed a few odd jobs and had done much begging.



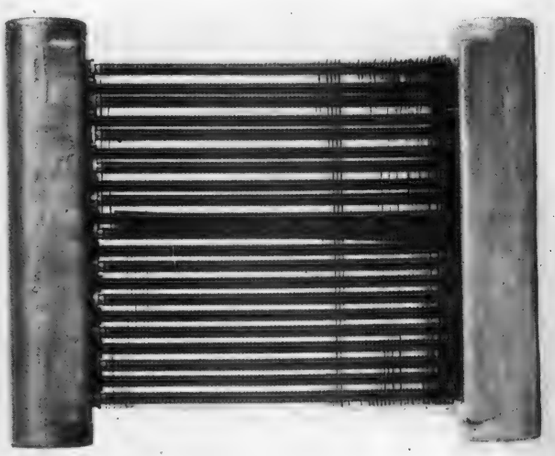


Fig. 10. Autovent Light-Weight Heating Surface

Fig. 11. (left) Chinookfin Heater Base and Method of Inserting Pipe

# The Old and the New in Greenhouse Heating

*by* **JOHN N. McARTHUR**

**J. N. McArthur**

Manager, Greenhouse Heating Department, Hitchings & Company. Mr. McArthur entered the employ of this company in 1880, and thus has a record of 49 years of continuous service.

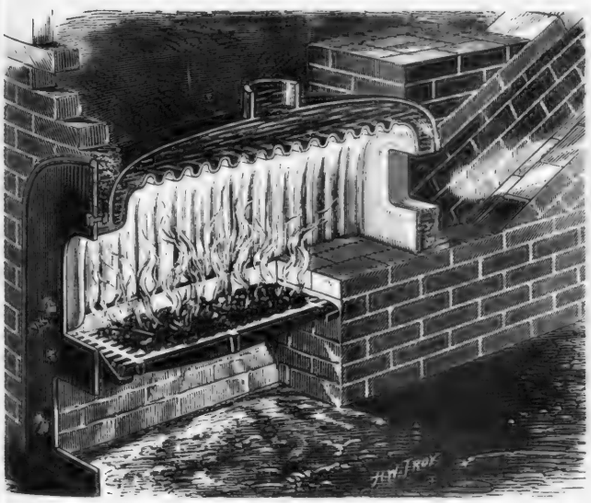
IMPROVEMENTS in greenhouse heating during the last twenty-five years have kept pace with the advances in other industries. Twenty-five years ago, greenhouses 16 or 18 ft. wide by 50 ft. long were considered quite large. They were often heated by a brick furnace and flue, which consisted of a brick furnace or fireplace, with suitable ashpit, firedoors and grate bars connected to a brick flue. This flue extended through or around the house and terminated at the base of the chimney.

The furnace was about 14 or 16 in. high from the grate bars to crown, with the grate bars varying in length from 3 to 4 ft. and in width about 18 in. It was built in an excavation, usually at one end of the house, with the front of the furnace in line with the house wall. Firedoors and ashpit doors opened into the fire room or pit excavated outside the house, to prevent the escape of gas and dust into the house when the fire was being cleaned.

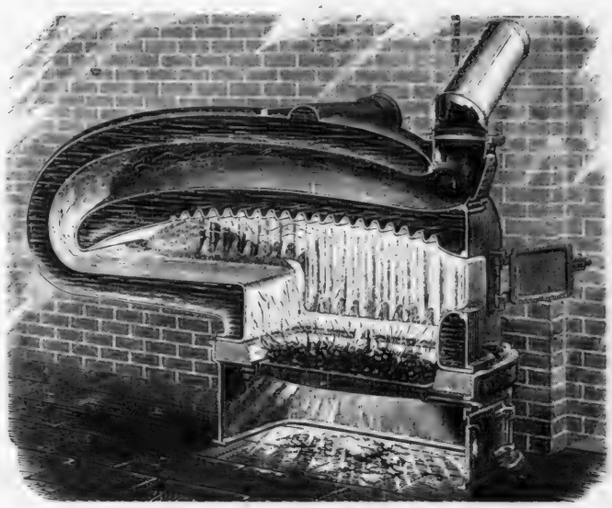
The size of the flue inside was about 10 in. wide and 16 to 18 in. high; the bottom was of brick, raised from the floor to allow the air to circulate under it. Side walls were of single brick and the cover or top of firebrick tiles. To insure a good draft the flue was seldom over 50 ft. long.

One objection to this plan of heating was the limited size of greenhouse that could be heated with one fire, the uneven temperature in different parts of the house, and the intense heat at the furnace end, as well as the escape of gas through the cracks and crevices in the brick work. There also was difficulty experienced in starting the fire during heavy, damp weather.

Later on, a heating system, com-



**Hitchings & Company "Saddle" Boiler Used 25 Years Ago for Greenhouse Installations**



**Patent Corrugated Firebox Boiler Formerly Made by Hitchings & Company for Greenhouse Heating**

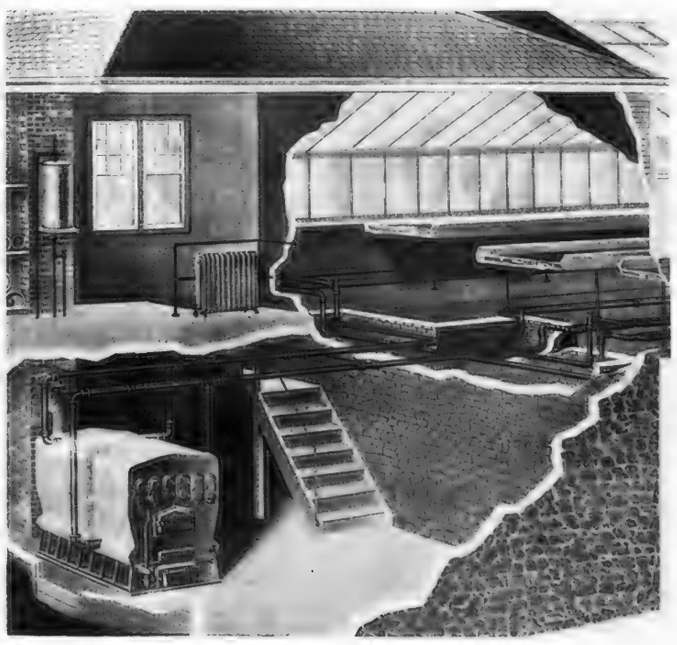
bining the heat from hot water pipes and brick flue, was used and was more preferable in many respects to the one previously described. The most intense heat of the fire was absorbed within the boiler and the danger and defects arising from overheating of the flue thereby were greatly obviated. At the same time, by a judicious arrangement of the hot water pipes, a more even heat could be obtained throughout the house.

Boilers used for this style of heating were of the saddle type. This boiler formed the sides and crown of the fireplace and rested on brick walls which formed the ashpit. The top of the boiler was set below the floor line of the greenhouse.

Hot water pipes extended along one side of the house and terminated at the expansion tank. The flue was connected to the outlet from the fire chamber at the rear end of the boiler and extended along the other side of the house to the chimney.

With a heating apparatus of this construction, the radiated heat was figured in the proportion of about two-thirds from the hot water pipes and one-third from the flue. When two small greenhouses were to be heated, one was heated by the flue, the other by the hot water pipes.

As the demand for flowers increased, longer and wider greenhouses were built. Twenty-five or thirty years ago, a greenhouse 20 ft. wide and 100 ft. long was considered large, and being too large to heat with the flue and pipe combination, the flue and pipe method was discarded and the entire house heated by the circulation of hot water. At that time few greenhouses were heated by steam, with the exception of large commercial places, which were few in number.



**Layout of Hot Water System for Greenhouse Heating**

The hot water boilers then used were not sectional, but cast or riveted together and shipped in one piece, ready to be placed on the ashpit, and connected to the coils, which invariably were placed under the plant bench.

Again, the flower-growing industry and the greenhouse building and heating industry have increased, so that houses 80 or 90 ft. wide and from 500 to 1000 ft. long are not unusual. These large houses are heated by steam (mostly low-pressure).

Some florists prefer the gravity system, with the boiler set deep enough so that no pumps or traps are necessary. Some prefer the boilers on same level as greenhouse floor, and others, the vacuum system.

Either system, when properly installed, will give satisfaction, but as the greenhouse heating system generally is in charge of one of the workmen, who is neither an engineer nor experienced fireman, it is advisable to install the heating system in the simplest manner.

Boilers for greenhouse heating generally are of the cast-iron sectional type for medium-sized greenhouses. For large-sized houses, the steel tubular boilers are preferred.

**Modern Greenhouse Boiler Plant**

# Ozone's Advance

*by* **HARRY L. BRANIGAN**

*Sales Manager, The Air Conditioning & Engineering Company*

A RESUME of the history and evolution of the use of ozone in connection with heating and ventilating practice could hardly be written without mentioning the name of Edwin S. Hallett, lately deceased, whose work as chief engineer of the St. Louis Board of Education has attracted wide and favorable attention in the field of ventilation.

Believing that economic operation and moderate first cost of plants were essential to the growth and extended use of the best ventilation for public and private buildings, Mr. Hallett was a pioneer in advocating the method of partial recirculation of air, and the use of ozone. His warm advocacy of these measures and the courteous manner in which he contended for their use will be well remembered by all those attending meetings of the A.S.H. & V.E. in recent years.

Casual investigation in any city will disclose ventilating plants which have scarcely been operated since their test runs were completed. Most of these plants are equipped with air washers, tempering and heating units and apparatus for the automatic control of temperature and humidity without provision for air recirculation.

The use of the so-called split system, where direct radiation is installed to heat the building, has made it especially easy for operating engineers to shut down and neglect the ventilating apparatus. Inquiry in regard to these conditions brings forth the reply that the cost of operating the ventilating plant is prohibitive.

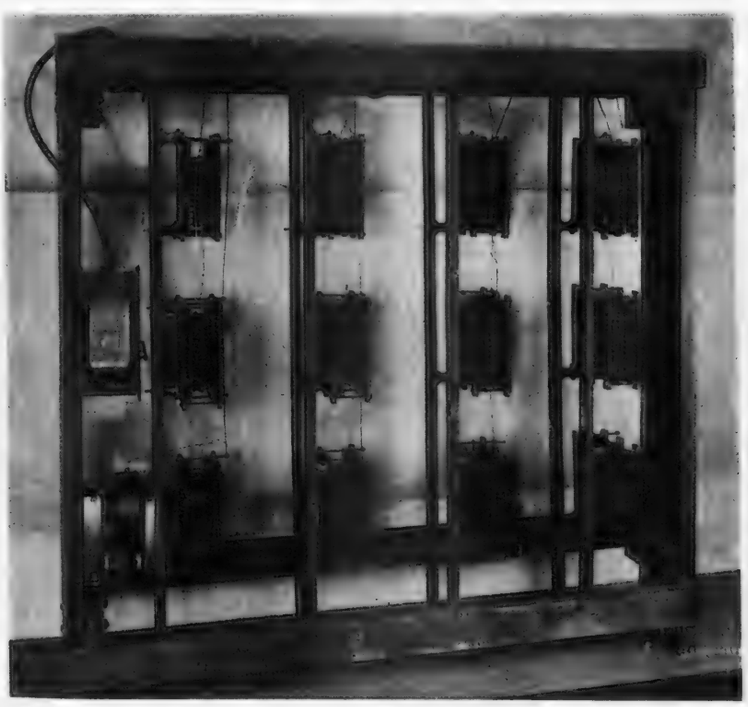


**Fig. 1. Early Frame-Type Ventilating Ozonator**

**Fig. 2. Modern Ozonator Plant**

It is generally agreed that the term "fresh air" as applied to the outside air is a misnomer, since the air of modern cities is laden with innumerable impurities from the by-products of industrial plants, combustion of fuels, automobile exhausts, etc.

The theory of increasing amounts of carbon dioxide in ventilation with danger of poisoning effects from this source has long been exploded, and it is recognized as a harmless inert gas, useful only as an indication of air vitiation. The supply of oxygen in air is so abundant that it very rarely affects its value for breathing purposes on account of reduced quantity. Many exhaustive tests have shown that air movement, temperature, relative humidity and odorous conditions largely are responsible for human comfort, and control of these factors indicates good ventilation or the lack of it.

Tests on school buildings supplied with standard quantities of cleaned, tempered and humidified air have shown that the air being exhausted from vent stacks was superior in

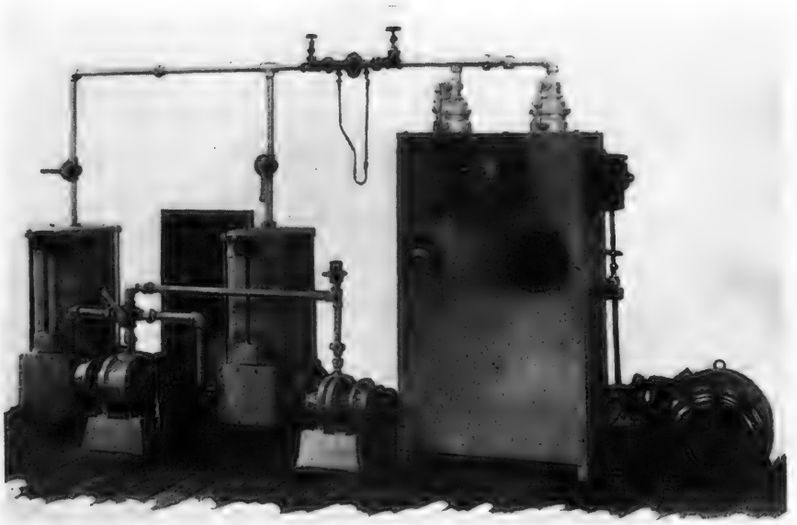


Fig. 3. High Frequency Ozonizer

most respects to that being taken in at the cold air inlets. The evacuated air showed only one deficiency, in that organic odors had been picked up in passing through the building.

The saving effected by partial recirculation in connection with the use of refrigerated cooling, as practiced in modern plants, is even greater than heating, and the newest theatres everywhere operate on this plan. Prof. George C. Whipple, of Harvard University, demonstrated several years ago by experiments carried on at Springfield, Mass., that recirculation provided a plentiful supply of air with no apparent sacrifice of the wholesome properties.

Confronted by these conditions, the use of ozone, was suggested for oxidizing organic odors and purifying the air in plants practicing partial recirculation. The first installation of an ozonator in connection with a mechanical system of ventilation was made at the O'Fallon School, St. Louis, Mo., in 1918. This building was equipped with a standard plenum system with air washer and provided 1500 C.F.M. using all outside air to each classroom. This building, still in use, is located in the Ghetto district and severe complaints had been made of the troublesome odorous conditions.

The trial installation proved so successful that within the following two years about twenty additional school buildings were furnished with permanent ozonator installations and at the present time this number has been increased to more than 100 buildings.

In 1921, under the auspices of the St. Louis Chapter of the American Society of Heating and Ventilating Engineers, a test was run at the Bryan Mullanphy School, St. Louis, comparing the quality of air supplied by partial recirculation with ozone with all outside air without ozone. This test was made under the supervision and direction of Dean L. A. Scipio, acting director of the Research Laboratory of the society (Pittsburgh, Pa.), and a full report was made in a paper read before the semi-annual meeting of the American Society of Heating and Ventilating Engineers, at New York City, January 24, 1922, by Edwin S. Hallett.

Two tests were made in this building which is equipped with a central fan system and air washer, first taking all outside air without ozone and the second while recirculating 65% of the air in the building and using an ozonator. A check of the tests made at this time showed that with recirculated air and ozone there were 36% less bacteria and 15% less dust than when using all outside air without the use of ozone. Odors were pronounced to be entirely absent in the recirculated air with ozone, while there was a noticeable odor without ozone.

Revolutionary improvements have been made in the manufacture of ozonators. Fig. 1 shows an early type of equipment that was installed in the air plenum between the fan and washer. Fig. 2 shows a modern enclosed type ventilating ozonator, fitted with air filter and dehydrator for installation outside the air ducts, arranged for piping the ozone to the fan inlet. Reliable, constant-output ozone generators and adequate provision for controlling the ozone production in accordance with fan capacity are features that have been perfected on modern ozonators.

It is not claimed by ozone advocates that ozone is a panacea for all the ills that may arise in ventilating plants, since it does not affect temperature, humidity, or dust content of the air, but they do maintain that when used in conjunction with partial recirculation up to 80% of the air supplied, it improves air conditions and permits large savings both in first cost and in operating expense of plant.

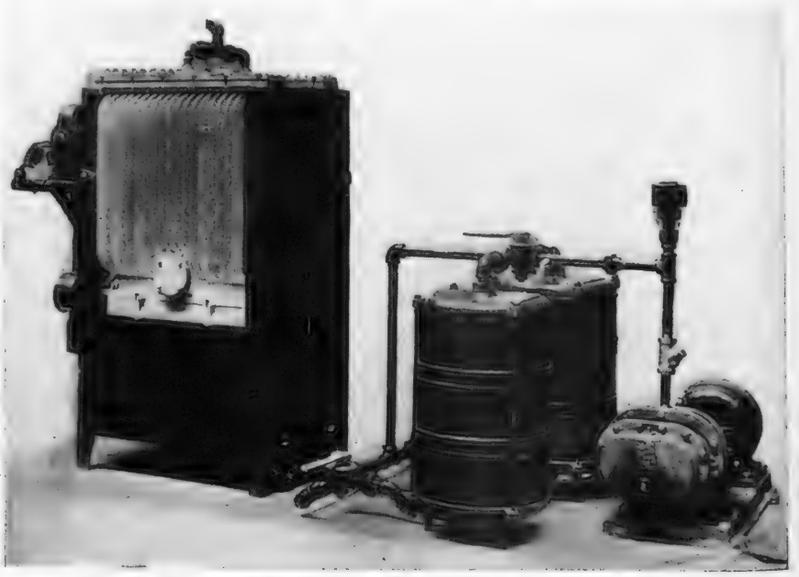
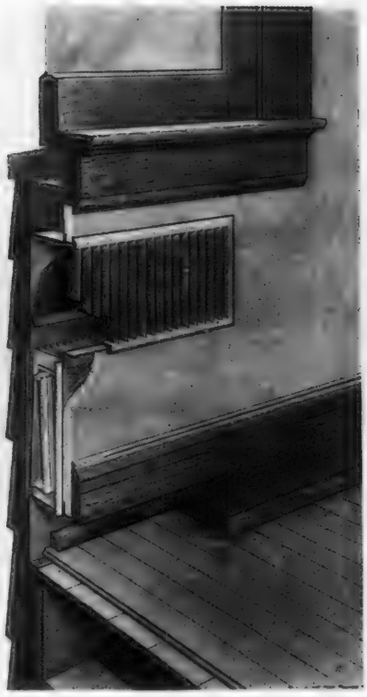


Fig. 4. Industrial Ozonizing Unit

# Concealed Radiation Marks New Epoch

*by* **G. E. OTIS**
*Vice-President, The Herman Nelson Corporation*



**Under-Window Type of Invisible Radiator**

THE concealed heater or invisible radiator is one of the signal contributions to the art of heating during the twenty-five years that have brought THE HEATING AND VENTILATING MAGAZINE a silver anniversary. A generation ago the cast-iron sectional radiator had practically supplanted the earlier forms of tube radiators.

Steam and water heat have contributed much to our present mode of living. Without radiators our modern buildings would be impossible, and the cast-iron radiator has been tolerated because of its service and utility. The public has never become reconciled to its size, weight and appearance and no substantial improvement has been made to correct any of these faults within the period mentioned.

Years ago an effort was made to remedy the situation by the use of indirect radiators but their application was limited and heating results were often unsatisfactory. Moreover, there were practical difficulties such as freezing and bursting and the collection of dirt and filth.

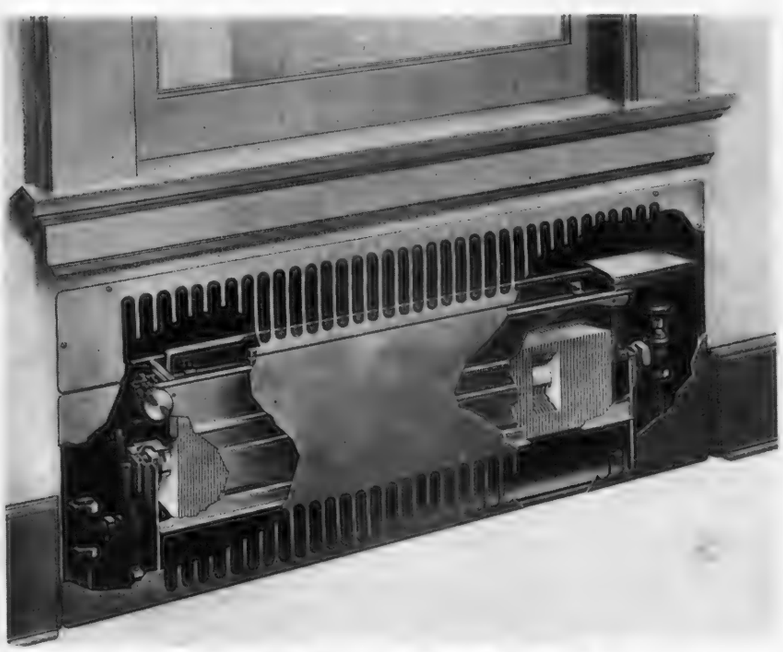
Later, an attempt was made to reduce the size and weight of radiators by the substitution of pressed-steel for cast-iron. These radiators were warmly received but time proved them impractical from a durability standpoint and they disappeared from the market.

Meanwhile, publicity campaigns which pictured the cast-iron radiator in pleasing environment and stressed its comfort-rendering qualities gradually served to break down opposition to its appearance.

Attempts also were made to improve the appearance, and designs have been developed recently which certainly represent a vast improvement over earlier types.

In many instances, architects have sought to relieve the situation by concealing cast-iron radiators in screened recesses. In many instances, however, these recesses were so constructed that the heating qualities of the radiators were interfered with and the recesses served as places for the accumulation of dirt. Moreover, such recesses required thick walls and were impractical in most instances.

Concealed heaters or invisible radiators, however, offer an improvement that is substantial in every respect. The size and weight of the radiator itself have been reduced to such a point that they are only about one-eighth the size and weight of cast-iron radiators having an equal heating capacity. They are so constructed that they may be installed readily in any standard wall or partition, out of sight and out of the way.



**Phantom View of Concealed Heater under Window**

The original invisible radiator was constructed as a complete unit, including the steel housing and grilles, and was so arranged as to be completely concealed, except for the grilles. Later, attempts were made to utilize various types of heating elements and concealing them in sheet-metal enclosures constructed in the field, but these proved to be more or less unsatisfactory.

Field constructed housings were not properly designed to develop the full heating efficiency of the radiators, were often not substantial and proved to be a source of considerable expense and annoyance to contractors. As a result, the successful radiators of this type on the market today are sold as a complete unit.

Due to the indestructible character of the heating element no provision is made for the removal of the heating element. This permits a construction whereby the plaster line or finish is carried straight through in front of the radiator. Other concealed radiators are provided with a removable sheet steel panel so that the heating element can be removed for repairs if necessary.

When the invisible radiator was first offered to the public it was made in two types, one in which the outlet grille was near the floor, designated as a low type and one in which the outlet grille was placed about 7 ft. above the floor, known as the high type. To some extent, this policy is still pursued, but the low types have proved so much more satisfactory from every standpoint that the high type gradually is being abandoned.

The higher types originally were made with the idea that with a given size of heating element more heating capacity could be developed and that where the radiators were placed on inside partitions the high outlet would be desirable from a decorative standpoint. Neither of these propositions has proved to be true.

While the higher radiators show greater condensing capacity, the room heating effect per pound of condensation is not so great as with the lower types. Moreover, from a decorative standpoint, the low types seem to be preferable even when placed on inside partitions.

## Simplicity of Damper Control Outweighs Slight Disadvantages

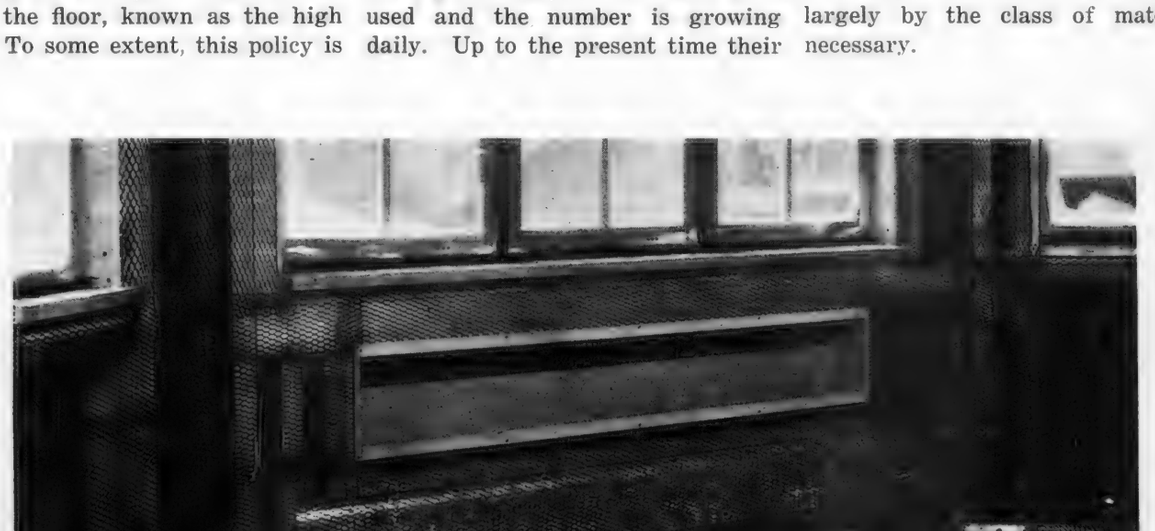
These radiators may be controlled either by means of valves or dampers. The damper method is not as positive because a certain amount of heat is given off by the radiator even when the damper is completely closed. Nevertheless, this amount of heat is so slight as rarely to be objectionable and the simplicity and ease of control offered by the damper method seem to outweigh the other defect.

Since the advent of concealed heaters a great many of them have been used and the number is growing daily. Up to the present time their use has been largely restricted to homes and finely-decorated apartments, but the field is enlarging. Before it can be greatly extended, however, architects and builders must adjust themselves to making arrangements for concealed pipe work since it is obviously inconsistent to use invisible radiators with exposed piping.

In many classes of buildings the difficulties presented by arranging the pipe work for invisible radiators will operate as a handicap which may take considerable time to overcome, but no doubt cooperation between builders and manufacturers will eventually bring this about.

At the present time the growth of the industry is further restricted by the necessarily increased cost of invisible radiators. However, the history of progress in this country shows that this is merely a question of time. With increased prosperity the cost of living is continually growing. The public is demanding improvements and is perfectly willing to pay for them provided they merit it. In no respect can any modern improvement be compared with previous means on a basis of cost.

The higher cost of concealed heaters is not occasioned by the fact that they are new and it is not likely that it will be greatly reduced with increased production. It is occasioned largely by the class of materials necessary.



**Method of Installing Concealed Heater in New Building**

# The Rise of Domestic Oil Heating

WHAT is perhaps the most sensational chapter in the history of the art of heating is that of the domestic oil burner which, in eight years, has developed to such an extent that now there are nearly half a million installations.

Although oil burners were in common use on the Pacific coast twenty years ago, the domestic burner was practically unknown in the East as late as 1921. Probably the first practical atomizing-type burner was developed about 1908, in the oil fields and used for firing the boilers which supplied steam for the drilling machinery. This burner was constructed of a ¼-in. pipe inside a ¾-in. pipe, as shown in Fig. 1. A steam line was run from the take-off of the boiler to the ¾-in. connection and the oil supplied either by gravity or pump pressure to the ¼-in. connection.

Steam and oil were discharged through the tip of the burner in an emulsified state, and the steam, discharging into the atmosphere, expanded rapidly, breaking the globules of oil into a mist. Air for combustion was drawn in by the natural draft of the stack through a checkerwork of fire-brick below the boiler. This method of atomizing oil has grown in favor until today we have many burners using the same method, but differently applied, as in the outside mixing burner, Fig. 2, and the inside mixing burner, Fig. 3.

About the time the use of oil became popular for such industrial applications as heat-treating furnaces in automobile plants, engineers discovered that oil could efficiently be burned by the use of compressed air, instead of steam, and that with air the pressure needed to be only 1 to 2 lbs. as against 80 to 125 lbs. pressure needed when using steam.

Designers tried numerous ways to obtain the proper combustion of oil. There were countless variations of nozzle designs, types of orifices and methods of atomizing or vaporizing the oil. Gravity-feed burners, mechanical-draft types, forced-feed burners and natural-draft devices were all tried and still are being used. Oil-burner design has not been standardized and probably never will be.

In 1925, there were said to be nearly 1500 manufacturers of various types of burners, and the problems as a whole were those encountered by any new engineering industry where design still is in a state of experimental development. The majority of the manufacturers at that time were small local companies who experienced a great deal of grief with their product, and their troubles worked hardships on the few reliable manufacturers.

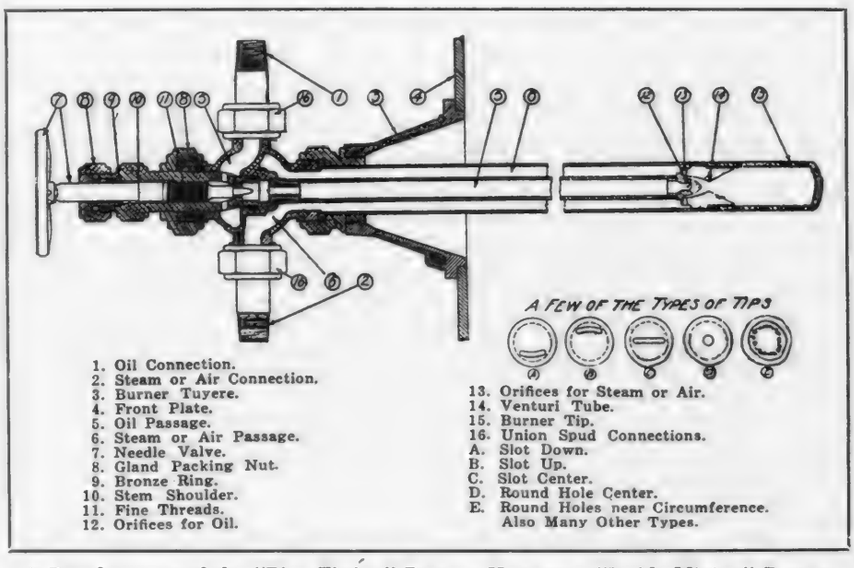
Consequently, the problems at that time were centered around the fly-by-night manufacturer, and the attempts to standardize at least the types of equipment.

The problem of standardizing the specifications for fuel-oil has been a live one for many years. As early as 1924 a report at the American Oil Producers' December meeting stated that the Bureau of Mines was cooperating with the burner manufacturers in an attempt to work up specifications for oil used by domestic burners. This has since been done, the specifications standardized and await only the approval of the Department of Commerce to become the official standards for the country.

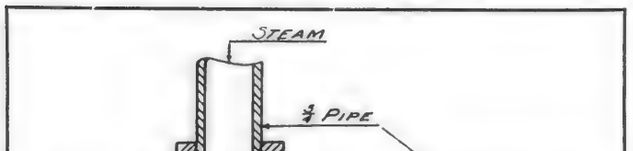
It soon became necessary to formulate rules for the construction and installation of oil-burning equipment, as well as for the storage of the oil. In 1924, an amended set of rules for New York City were adopted by the New York City Board of Standards and Appeals, covering such points as location and capacity of tanks, requirements of valves, control of oil flow, etc.

By that year the number of installations of domestic burners had increased to 100,000, and the heating fraternity, the insurance underwriters and home-owners all were becoming interested in this comparatively new device which was making house-heating almost completely automatic.

The Underwriters' Laboratories has been a vital factor in aiding the manufacturer to develop a safe de-




**A Development of the "Pipe-Fitting" Burner, Known as "Inside-Mixing" Burner**




An Early "Home-Made" Atomizing Oil Burner

A Development of the "Pipe-Fitting" Burner, Known as "Outside-Mixing" Burner

vice. Rigid requirements have been set up by the laboratories. To obtain its approval a burner must pass tests which insure safe and reliable operation under severe conditions. That the majority of the burners produced a few years ago were unable to meet the tests required by the laboratories is shown by the fact that in July, 1925, the laboratories issued a list of approved oil burners containing 22 names, whereas the July, 1928, list contains 131 names.

Servicing always has been a phase of prime importance with manufacturers and dealers. The large number of failures in the domestic oil-burner field has partly been due to the failure on the part of many concerns properly to provide a reserve to take care of the servicing, which, in many cases, entailed prohibitive costs. Mergers of several large companies and the sound financial backing of the more important manufacturing companies have aided in the partial solution of this problem.

A subject which has agitated the industry all through its history has been whether or not burners should or should not be applied to existing coal boilers or whether especially-designed oil-burning boilers should be developed. While, no doubt, it is true that the specially-designed boiler can operate at higher efficiencies than a conversion installation, it also is true that there is considerable more sales resistance to overcome, due to its higher cost. There are several highly-successful oil-burning boilers on the market at the present time, and since there is a market for these, in new installations especially, there is room for both the converted job and the special boiler.

It is only within the last three years that electric controls have reached a state of development demanded by the burner itself. Controls now are a highly-specialized phase of the industry and manufacturers of such equipment are keeping pace with the demands for automatic operation of temperature control, steam and water safety controls, and have produced safety devices to shut off the burner for any or all types of failure of operation or response.

Among the tendencies which can be noted at the present time are those toward higher oil pressures, more fully-automatic burners and the production of burners for small homes. The oil burner has ceased to be a luxury and is available for the owner of the very small bungalows and residences. This widens the field of prospects for the oil burner and will enable the industry to maintain its present production of over 100,000 burners a year.

# Downs and Ups of the Oil-Burner Industry

*by* **A. B. FRENIER**
*Designer of the Nokol Burner*

ON accepting your invitation to comment on the evolution of automatic, domestic oil heating the past quarter-century, to be published in the forthcoming Silver Anniversary Number of your most worthy journal, THE HEATING AND VENTILATING MAGAZINE, I am reminded of your editorial, appearing in the July, 1920, issue, in which you took occasion to remark that the kerosene or other hydrocarbon burner "has again elbowed its way to the front in a way to challenge the attention of engineers" and that this topic of domestic oil heating with kerosene or other distillates "was up for discussion at a recent meeting of the National Warm-Air Heating and Ventilating Association where the points made by the principal speaker will be found of more than ordinary interest."

You further stated "it will be interesting to see how far the engineering world will go in taking up with kerosene fuel. That it has possibilities, that were never fully realized until the present crisis focused fresh attention upon it, is becoming generally recognized. At any rate, it will be worth while for all concerned to familiarize themselves with this, as well as with other recent developments to place kerosene where its advocates think it belongs."

As I was the "principal speaker" in this discussion before the National Warm-Air Heating and Ventilating Association, back in 1920, and THE HEATING AND VENTILATING MAGAZINE was the first publicly to recognize the then tottering infant—the domestic oil-heating industry—it is only fitting that you should now be first authentically to trace its progress, recording its ups and downs, its struggles, its defeats, and final victory; not only as a matter of possible interest to the public, but also

as justification of your prophecy made ten years before.

While articles in magazines, trade papers, and the patented art, expiring and existing, disclose thousands of oil-burning devices, including many attempts to apply same to house heating furnaces, it was not until a few years prior to 1920, the advent of the fully automatic burner, that automatic heat for the home from liquid fuel, initiated at a touch of a button and automatically continued, became a reality. It marked the birth of a great industry, the value of the products of which has long since reached tens of millions of dollars annually.

While automatic heat for the home actually was launched as an industry in 1918, through the installation of a few hundred burners, followed by the installation of several hundred per year for the following three or four years, it was not until 1922 that real progress was initiated.

At first, a misconception with respect to the enormous profits in the business, coupled with a total ignorance as to the mechanism essential to successful automatic oil-heating devices, and the belief that the marketing of such devices was as simple as peddling peanuts on a popular street corner, was productive of a horde of irresponsible vendors of impossible devices.

Due to the short span of life of many of these misfits, little harm was done to the infant industry. These, however, were closely followed by a little higher class of aspirants to fame and fortune via the oil-burner route.

True to form, as in all new industries, the time seemed ripe for the enthusiastic promoter of trade associations to get busy. This he did by herding as many of the oil-burner manufacturers that could raise the price of a membership fee into what is known to-day as the American Oil Burner Association. (This statement is not made disparagingly of the American Oil Burner Association as it now exists, for it is a well-managed concern, doing wonderful work.) Through the holding of annual national conventions, and through other activities, the public was led to believe that the association membership represented a group of substantial and successful manufacturers entitled to its support and confidence; and it was further led to believe that the products of the various members of the association must be right since they carried the stamp of approval of the Underwriters.

At this stage of the development of the industry, parties of greater financial strength and of apparent better business judgment entered the field as competitors. Many of these parties were men of high standing in the business world, and their success in former business pursuits would seem to have followed the exercise of good business judgment. Yet when entering the oil-heating field, their actions many times were hard to reconcile with their previous reputations. The lavish expenditure of money in the almost unlimited use of full-page newspaper space, making needlessly and uselessly extravagant claims of their wares, and crying down the reputation of others, rapidly undid the careful work that had been expended years previous in the building up of the industry.

Coupled with this was the other and more vicious propaganda, widely spread by the makers of inferior devices, that the better grades of oil would not be available; and that the public would not be justified in buying a burner that was incapable of burning low-grade fuel.

And about this same time, the report of President Coolidge's Oil Conservation Committee, as interpreted by those opposed to oil heating, made it appear that the supply of crude oil was exceedingly limited; that in point of fact, it could not last more than six years. This, of course, badly frightened the public.

It was a combination of all these conditions, in my opinion, that slowed up, to an alarming extent, that rapid development of the oil heating industry to which it was entitled.

It became apparent that concerted action must be taken at once to offset these evils. We knew of no better way than national co-operative publicity on the part of the better class and more substantial element of the oil-burner manufacturers.

The large number of the better and more substantial manufacturers, who had paid dearly for their errors on entering this field but were slowly and substantially developing their business, met at French Lick, in March, 1927, for the purpose of discussing the situation and taking the necessary steps to put the industry on a proper basis. As the result of this meeting, the requirements for association membership were made more rigid and it was agreed to raise a fund of sufficient proportions to start a national co-operative publicity campaign for a period of five years, that the public might be properly educated as to the advantages of automatic oil heating. Steps were taken to put the association's affairs in the hands of a competent manager who had sufficient standing and ability properly to direct its operations and induce oil companies and others who were profiting from the industry to contribute to this national publicity fund.

Since that time, the work of the association has been carried on in a most successful manner; and in a general way has been productive of much good to the industry.

The automatic oil-burner industry has passed through much the same experience as has the automobile manufacturers. As with automobiles, which have after many years settled down to three or four distinctive types and designs of cars, we find the oil-burner products represented by three distinct types: the original combustion chamber, or as it is sometimes referred to—the "pot-type"—burner; the open flame or gun-type burner, and the rotary burner.

With the automatic oil burner product developed to its present high standard of efficiency, and all the early difficulties and handicaps gotten rid of, and the adoption of sound and sane business methods in the production and distribution of oil burners, a most successful and brilliant future is in store for the industry.

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## Welding School Expands Facilities

To meet the increasing demand for practical instruction in arc welding, the welding school maintained by the Lincoln Electric Co., Cleveland, O., is expanding its facilities. No tuition is charged at this school and any ambitious mechanic is free to take the course, which is of six weeks' duration.

The progress of the individual student is limited only by his own aptitude and application. The school is under the direct supervision of Arthur E. Madson.

Brick Wall Will Be Used over This Base of Insulating Board

# Types and Features of Building Insulation

*by* **H. S. ASHENHURST**

Insulation in Rolls Is Easily Cut and Fitted

Placing Poured Type of Insulation

THERE is perhaps no one feature in building construction in which so great a change has taken place as in the general use of insulation in the walls and ceilings of homes. A striking example of the change in attitude on this subject is shown by the statement that, as late as 1924, the subject of insulation was not seriously considered in the construction of a home. During the past year there have been many instances where the outside walls of old buildings have been opened up, and some bulk material blown in or stuffed in to fill out the entire space between the studs, and to a depth of several inches between the upper ceiling joists.

Several factors have contributed to bring about this new condition. With an increasing interest in insulation a number of manufacturers have come into the field. Many new forms of insulation have been devised. All of these manufacturers have done large or small amounts of advertising, and this has acquainted the general public with the benefits to be derived therefrom.

Records have been kept of the results obtained where insulation has been intelligently applied in building. These results have been so satisfactory that they have been published in many magazines and newspapers. It has been demonstrated that by the proper use of insulation in homes it is possible to heat them comfortably with ease in the coldest weather, whereas, before, they were always uncomfortable when the thermometer reached the zero mark.

H. S. Ashenhurst

In addition to this, great fuel savings have been shown. The use of insulation has shown that it is possible to eliminate the discomfort that comes in the summer months through hot sleeping rooms. This information has come through records showing that in the hottest days of the summer the upstairs rooms of a home where the ceilings have been thoroughly insulated show no higher temperatures than the downstairs rooms. The public has learned of the advantages of insulation until, today, every up-to-date builder considers insulation in some form in his high-grade houses.

Perhaps the one agency that has contributed more than any other to the spread and use of insulation in homes has been the gas companies. Just at the time house insulation was in its infancy, heating homes with

gas was in its infancy. It did not take the public long to become sold on the advantages of gas-heated homes, but the extra cost over coal made many of them hesitate.

Then the insulation industry solved the problem. Some demonstration houses were built. These houses were thoroughly insulated with bulk insulation, filling the space between the studs and the upper ceiling joists. Gas-heating plants were installed, and a careful record kept of results.

The astounding fact was demonstrated that with the proper use of insulation it was possible to cut house-heating estimates one-third over the house of ordinary construction not insulated. Ceilings of old homes were insulated. Again records were kept, and it was shown that in many cases savings of from 20% to 25% were possible through insulation where ceilings alone in one-story houses were insulated.

With this information the gas companies began to consider insulation as a method of putting over the house-heating business. The American Gas Association appointed a committee on insulation. This committee, realizing the necessity of putting the exact facts about insulation before the public, prepared tables showing the values of the different insulating materials in common use in terms of thickness, and in addition published information showing the thickness of insulation necessary in walls and ceilings to produce various percentages of fuel savings.

To-day most of the gas companies are advising their customers to use insulation in the construction of new buildings, and are helping them to reduce heating costs by advising them of the advantages to be gained by ceiling insulation in old buildings. Some companies have advanced to the point where they make ceiling insulation a part of the house-heating equipment.

**Quilt Insulation Is Easily Applied to Irregular Surfaces of Attic Room**

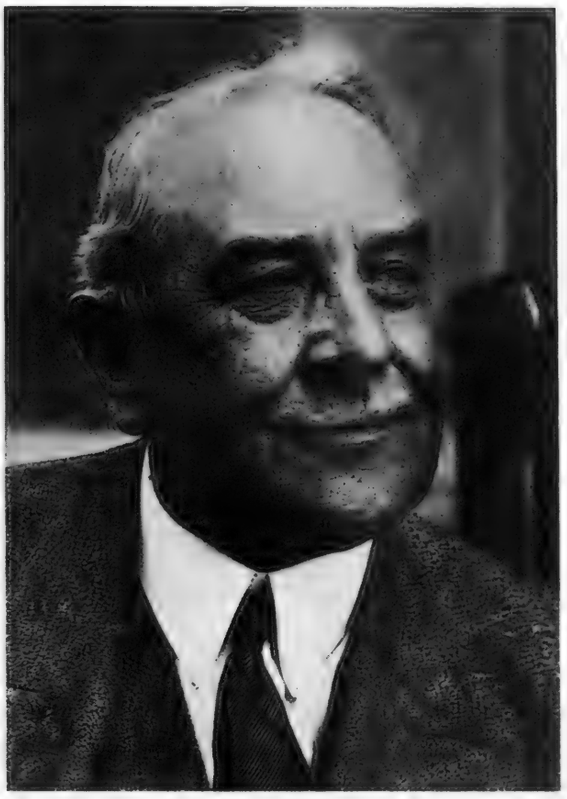
**Spraying a Flake Insulating Material**

**Insulating Board Being Applied to Studding**

**Applying Plaster on Insulating Board**

Various organizations connected with the heating industry have begun to give their members information regarding factors to be used in computing radiation where insulation is used in construction. One of the most important pieces of work done in this connection is contained in the pamphlet published by the Illinois Master Plumbers' Association which enabled the steamfitter to tell at a glance just how to figure the radiation in an insulated and an uninsulated building.

It is very evident from the foregoing facts that the insulation age is here. When it is considered that this has all come about within five years, the results are astounding. My vision is that within the next few years, the ceilings, at least, of every home will be insulated. This will mean comfort, happiness and economy to a greater extent than is possible in any other way in home construction. Along with insulated homes will come cooling systems in summer, which will make commercially possible a home in which a temperature will be maintained of 70° F., day and night, 365 days in a year.



Henry Baetz

# New Epoch Ushered in by Unit Heaters

*by* **HENRY BAETZ**

*A Pioneer in the Field of Unit Heating*

THE growth of the unit heater business, which came into being thirty years ago, has practically been contemporaneous with the splendid growth and advance to the forefront of THE HEATING AND VENTILATING MAGAZINE, whose silver anniversary is being commemorated with this issue.

The term "unit heaters," and what it implies in the way of the heating method, is understood by the trade. It may be well, however, to explain here wherein this method differs from those which preceded it; particularly as regards industrial plants.

The old method, known as the fan-blast or blower system, had a monopoly twenty-five years ago in the heating of factory buildings. It employed the fan and heating coil as does also the unit heater method, but its *modus operandi* was totally different. It sought to obtain the desired even distribution of warmth by means of a net work of distributing ducts. From these the hot air was discharged through numerous jets at close intervals.

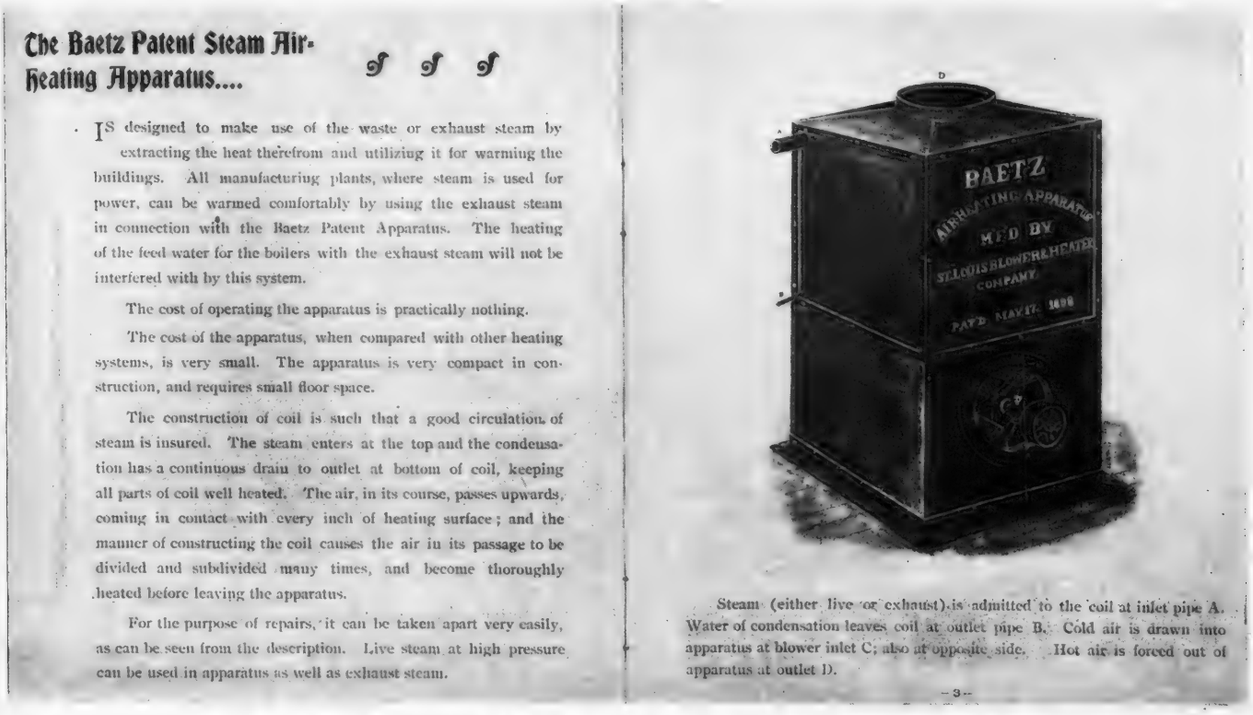
On the other hand, the unit heater method dispensed with this entire arrangement of ducts. The natural movement of the air was depended upon to obtain a uniform temperature. This movement was expedited by the action of the heater fan discharge which forced heated air into the warm air of the upper portion of the room, dragging the latter along and crowding it against the cold wall where it naturally fell as it cooled. At the same time the suction of the fan was drawing to itself the cooler floor air to be again passed through the heater.

Baetz Air Heating Units Used on Each Floor of Factory, 1902

By this method it was found possible to maintain in the room an air movement which was imperceptible, but constant, harmonious and uniform. The result of such a movement is not only a comfortable temperature everywhere but, also, a certain freshness of the air which is helpful to human energy.

The unit heater method is the sole method which operates by means of a uniform mass-movement of the air body of the room. All others supply heat to a practically stationary air body by delivering it at numerous spots within that body. This spot heating occurs in the direct radiation method, as well as in the fan-blast method. The only distinction between the direct radiation and the fan-blast method is that the former uses steam with many radiators, while the latter uses hot air ducts, and numerous jets.

When the new method was introduced, it was marked by the elimination of distributing ducts, which meant a saving in cost of frequently more than half. When we view this fact and realize that the method was destined to save industry, in general, so many millions we would naturally



**The Baetz Patent Steam Air-Heating Apparatus....**

IS designed to make use of the waste or exhaust steam by extracting the heat therefrom and utilizing it for warming the buildings. All manufacturing plants, where steam is used for power, can be warmed comfortably by using the exhaust steam in connection with the Baetz Patent Apparatus. The heating of the feed water for the boilers with the exhaust steam will not be interfered with by this system.

The cost of operating the apparatus is practically nothing.

The cost of the apparatus, when compared with other heating systems, is very small. The apparatus is very compact in construction, and requires small floor space.

The construction of coil is such that a good circulation of steam is insured. The steam enters at the top and the condensation has a continuous drain to outlet at bottom of coil, keeping all parts of coil well heated. The air, in its course, passes upwards, coming in contact with every inch of heating surface; and the manner of constructing the coil causes the air in its passage to be divided and subdivided many times, and become thoroughly heated before leaving the apparatus.

For the purpose of repairs, it can be taken apart very easily, as can be seen from the description. Live steam at high pressure can be used in apparatus as well as exhaust steam.



Steam (either live or exhaust) is admitted to the coil at inlet pipe A. Water of condensation leaves coil at outlet pipe B. Cold air is drawn into apparatus at blower inlet C; also at opposite side. Hot air is forced out of apparatus at outlet D.

—3—

**Unit Heater for Factories, Sold by St. Louis Blower and Heater Company in 1902**

suppose its acceptance to have been immediate. Such, however, was not the case and the usual troublesome pioneering work was necessary.

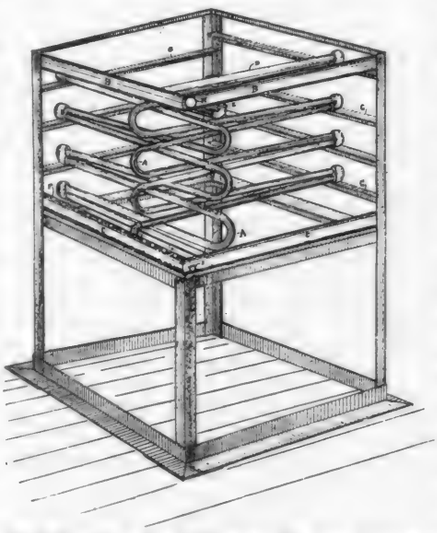
The low cost of the new method made a strong appeal, but its surprising simplicity also gave rise to serious doubts that the thing could do the work.

Only a few years ago a picturesque demonstration of the method was staged. It was illustrated in the *Journal* of the American Society of Heating and Ventilating Engineers, and was given wide publicity. The demonstration was under the direction of an eminent engineer, Thornton Lewis, who has contributed markedly to engineering knowledge. It was cleverly conceived. By using smoke it enabled the eye to follow the air as it left the heater outlet.

The demonstration well illustrated the unit heater method. It showed that the air moves along in a perfectly natural way, just as it had in the numerous unit heater plants which had been in operation for many years.

Of that great number, mention of at least one at this point may be of some historic interest and therefore permissible. The American Stove Company has factories in a number of cities, all of which use the unit heater method of heating. The factory at St. Louis, Mo., was built 20 years ago. The heat losses here aggregate twelve million B.T.U. per hour. To supply this amount of heat, twelve unit heaters were installed when the factory was built, and they are operating now precisely as originally installed. Competent engineers consider this plant as representative today of what a unit heater method should be.

Before the World War period many large plants had been equipped with the new method. During the war the demand for the heaters showed a notable increase. About this time architects and engineers in general became interested and the sale of unit heaters went forward still more rapidly.



**Coil Used in Unit Heater Shown Above**

The onward march of the new idea had its effect on the builders of heating apparatus, and during the past decade it caused them to change from skeptics to enthusiastic advocates, and "Heat with Unit Heaters" became the slogan. This readjustment to meet new conditions represented one phase of the development of the unit heater business. So far as the method itself is concerned, there has been no development or evolution whatsoever. That is today exactly as it was originally conceived.

New beginners attracted by the fine prospects came into the field in goodly numbers, and that also was part of the business development. The great variety in design and their constant increase in numbers, was another and quite conspicuous phase of the development and growth of the business.

It is not the purpose here to praise or find fault with any makes or designs of unit heaters. All have their good points and all no doubt have their proper place. The point of the whole matter is to be found in the fact that many are now in the field while still more are constantly entering it. This fact indicates that the method is a sound one and that the field still offers opportunity which is gratifying.

# The Rise of Heating Controls

## 1. History of the Heat Regulator

*by* **J. W. PAULING**

*Minneapolis-Honeywell Regulator Company*

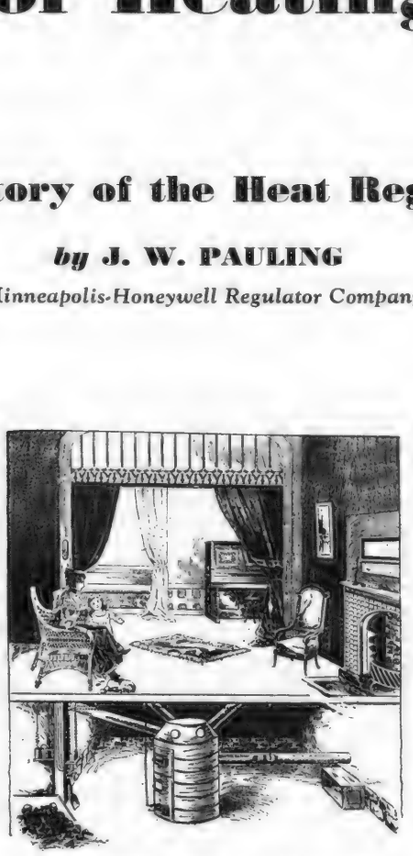
POSSIBILITIES latent in the simple fact that different materials respond to heat or cold by contraction or expansion at different rates of speed were first realized in 1883, when A. M. Butz fastened a strip of hard rubber to a strip of copper.

When cooled, this strip of two attached materials bent in one direction and made an electrical contact that caused a clocklike spring motor to open a furnace draft. When the combination strip got warm it bent in an opposite direction, making an electrical contact which caused the motor to close the draft.

Thus was the thermostatic principle of an automatic heat regulator invented 46 years ago.

Only with great difficulty was this crude device applied to damper control as it was so weak that dampers had to be well counterbalanced to enable the clocklike motor to lift them. Often nothing more than a slide or possibly a section of disc, which could be rotated by hand, served as a means of controlling the fire. Dampers hinged at the top, so that a motor could handle them, were a very special design furnished only upon demand, because the few furnaces used for domestic heating were intended to be hand-controlled.

A spring motor, with adequate power to lift the damper without counterbalancing and introducing the patented forked switch, was developed by a Mr. Guion in 1886. At about this same time the thermostatic element was first made of two different metals instead of metal and rubber.



**Early Advertisement for Thermostat Used with Draft Regulator**

This newly-developed element construction increased the range and sensitivity of the thermostat, and improvements in the design of the spring-driven motors made them applicable to a wider range of use. It was many years later before the furnace and boiler manufacturers came regularly to supplying lift-type dampers suited for use with heat-control equipment.

Originally silver contacts were used on the electric contacting surfaces of the thermostat, but later developments in design proved platinum iridium superior to silver, with the newer-designed coiled thermostatic element which further improved the accuracy and extended the range of operation and application.

The noble animal, the horse, had to do with the ingenious application of the alarm clock principles to open drafts early in the morning. About 1885, when the heat regulator was in its infancy, the feeding of horses early in the morning was a common problem and the alarm clock principle was applied to release grain into the feeding boxes at an early hour in the morning, which made unnecessary the usual early arising hour to feed the horses before starting to work. This same principle was applied to the thermostat about 1907, and, for quite a few years later, the one-day clock generally was accepted as the much-sought-for refinement in thermostat construction, even though it required daily attention at the retiring hour.

A few years later the eight-day clock principle was applied to the thermostat but this design still required attention at the retiring hour; however, the clock would run and the alarm function for a period of eight days.

Development of a gravity or weight-operated motor furthered the sale of damper controls which, in the main, originally were accepted as a means of economy and convenience in the operating of a furnace.

It was not until 1910 that thermostatic controls were mounted directly on the boilers and furnaces, but their great value remained unaccepted until years later.

The advent of the electrical age and the desire further to lessen the manual attention to heating plants brought about the development of the eight-day automatic thermostat which lowered the temperature at night and adjusted itself for the day temperature in the morning for a period of one week.

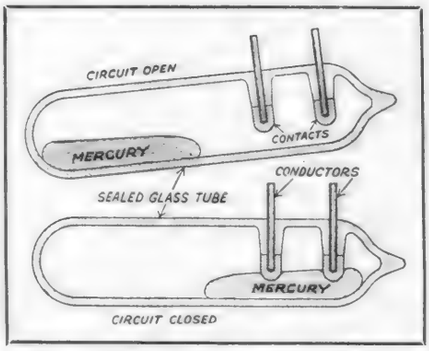
Electric-driven regulator motors were satisfactory for damper control but they were redesigned to function both mechanical and electrical devices necessary for burning oil and gas

which were fast becoming quite popular.

Relays operated by thermostats for controlling oil burners were developed about 1922. With them were introduced the electric and magnetically-operated oil and gas valves, so necessary for proper operation of oil and gas-burning equipment.

A few years later, the first Protectorelay, incorporating safety features, in case of flame failure, was announced. Around their principle of operating has been built the present-day type of relay controls with their wide range of application, dependable safety features and almost universal use.

Thermostats were further improved and simplified and different types of boiler controls, or limiting devices,




**Mercury Tubes Used in Many Types of Controls**

were developed for use with the various types of heating systems employing air, water, vapor and steam—both high and low pressure.

Boiler controls or limiting devices, so necessary with the use of oil and gas-burning devices, came into general use with the refinement of the burner equipment which in many instances required a complete control system, consisting of several units.

Use of natural and manufactured gas for domestic and commercial purposes made necessary the designing of special equipment for safely controlling the gas supply against the possibility of trouble from the flashbacks, faulty ignition, etc.

The commercial use of electricity, gas, oil and air has prompted the designing of much special-control equipment and at the rate applications of control apparatus are fitting into industry, it is predicted that the future industrial development will depend more on the heat controlling equipment to carry out certain programs, than is at present anticipated.

# 2. Automatic Controls for Heating Appliances

*by* **ELLIOTT HARRINGTON**

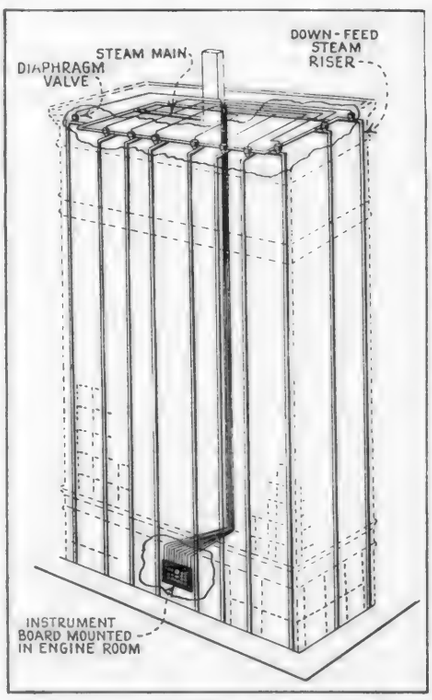
*General Electric Company*

IT was not so very long ago that father had to arise early on cold winter mornings, descend to the basement, stoke the furnace and open the drafts. After that he wandered back to bed for the balance of his interrupted rest. Then during the day he or the members of his household juggled damper chains in a vain effort to keep the home at reasonably constant temperature.

But now, it is a different story. Modern automatic temperature control equipment maintains the room temperature at a comfortable and substantially constant value, day in and day out, through the cold months with little or no attention from the occupants of the home.

Probably the beginning of automatic control for the domestic heating plant came when some lazy fellow who objected to the early morning trips to the basement, set the family alarm clock to go off at 5:00 A.M. and pull a trigger out from under the check draft.

With the invention of the thermostat came the draft regulator, operated by a clockspring motor to close or open the drafts of the coal-fired furnace at the call of the thermostat. A later model of this control replaced the clockspring motor with an electric motor, thereby eliminating hand winding of the spring and giving complete automatic control. Additional refinements and improvements have been made in this control including a clock on the thermostat to hold the home at a reduced temperature during the sleeping hours, thereby saving a certain amount of fuel.




**Diagrammatic View of Typical Zone Control System**

With the advent of the hopper-fed automatic stoker burning the various grades of coal with forced draft, it was necessary to modify the thermostatic damper control to start and stop the fan motor at the call of the thermostat. Also, with the automatic stoker it is desirable to use some form of furnace-limiting control. This control prevents building up too high a pressure or temperature in the furnace when the thermostat continuously calls for heat over a long period of time, as it does when bringing the home up to temperature on a cold morning.

Probably the most complete example of automatic temperature-control development for the home is found on the gas- or oil-fired burner where

the fuel is of such a nature that it can readily be fed to the burner automatically and without manual effort.

The gas control consists essentially of the thermostat mounted in the principal living room, a solenoid valve for cutting on and off the gas supply at the call of this thermostat, a pilot light for igniting the main flame, a thermostatic means to prevent feeding gas to the burner unless the pilot light is lit and a furnace limiting control to prevent excessive pressures or tempertaures. This control operates on the "full on" or "full off" principle.

One very novel gas-burning warm-air furnace utilizes a thermostatically-controlled valve to gradually vary the size of flame over a given range and thereby adjust the supply of heat exactly to equal the demand.

The fully-automatic oil-burner control consists primarily of the thermostat, means for controlling starting and ignition, a safety device to prevent collection of unburned oil vapor in the combustion chamber and the regular furnace-limiting control.

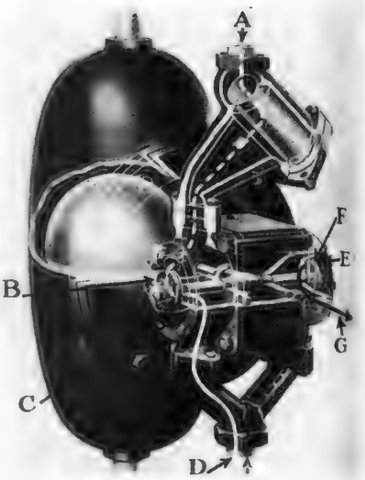
Originally, thermostats were of the low-voltage type using a bi-metal element to effect the necessary electrical connections at the "start" and "stop" temperatures. A modification of this thermostat successfully operates on line voltage, using a mercury-tube contact operated by some form of expansive element. A clock may be applied to either type, if desired, automatically to reduce the night temperature. One manufacturer is supplying an electric clock driven by a small synchronous motor, thus eliminating hand-winding.

When the burner is required to operate for a long period of time to produce the required temperature, enough heat may be stored in the system to "overshoot" the room temperature several degrees above that for which the thermostat is set. In one form of thermostat this "overshoot" has been eliminated by using a small heater element in the thermostat which causes it to shut down the burner when the room is several degrees below the desired point, thus allowing the stored heat to "coast" the room up to temperature. In case it does not reach the desired temperature by the time the heater has cooled down, the thermostat brings the burner on again.

Another manufacturer accomplishes a similar result by using the equivalent of two thermostats. One mounted out-of-doors approximately adjusts the heat supply to the heat demand and another mounted indoors gives a fine regulation of heat supply.

The starting of the burner usually is accomplished by starting the motor which delivers the combustion air and oil to the combustion chamber. If it fails to ignite within a given time the burner is shut down by a timing device. However, if it ignites in the normal manner, the protective device operates to short-circuit the timing device and operation continues.

The protective device is a heat-responsive mechanism which may take several forms. It may consist of a high-temperature thermostat mounted directly in the oil flame, a thermostat mounted in the breeching




Low Water Control

to operate on flue-gas temperature or a device mounted to "look" at the flame and operate on radiant heat.

Furnace-limiting controls are all temperature responsive devices in which a normally-closed electrical contact is caused to open by the rise of steam, vapor, water or air temperature in the furnace, depending on the type of heating system. With a lowering of this temperature to a predetermined point, this contact is reclosed to bring the burner on again provided the thermostat is still calling for heat.

In addition to the above essential elements, there are certain auxiliary control devices available, such as a low boiler-water cutoff, an oil-overflow cutoff, an automatic draft regulator and a thermostat for controlling the temperature of domestic hot water heated by an indirect heater on the boiler.

## 3. Fan and Motor Controls

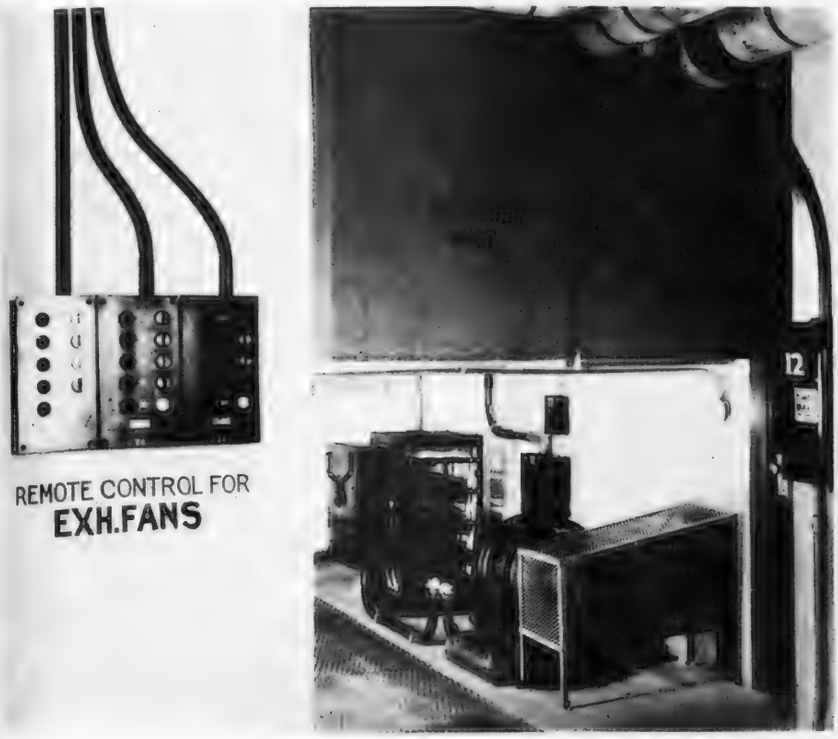
*by* **V. L. SHARPE**
*General Electric Company*

WHEN fans were first applied to forced ventilation little consideration was given to the amount of air required to be moved as long as there was no serious air noise due to its velocity.

At first fans were driven at a constant speed and no provision made for changing the quantity of air moved, other than by starting and stopping the fan. Later came the damper control that provided an adjustable outlet which regulated the amount of air moved. After the electric motor was applied to driving ventilating fans, it was found that speed variation of the motor and, in turn, the fan, could be satisfactorily obtained and the proper quantity of air supplied for various conditions.

The problem of air volume control then became a matter of motor-speed control. A change in the motor speed is made for various reasons. Sometimes it is simply to correct unavoidable differences between actual pressure conditions in the ducts, as compared to those which were estimated. In such cases only a small variation in motor speed is necessary.

Variations in the number of occupants of large rooms may require




**Controls for Ventilating System**

a change in the rate at which the air in those rooms is renewed. Changes of weather conditions also may require changes in the air supply by varying the motor speed. Winter conditions may involve the moving of large volumes of heated air to secure proper temperatures in the room; extreme summer conditions may require large volumes of cool air to keep the temperature down; the intermediate conditions may require a greatly reduced volume of air. It seldom is necessary, however, to vary the motor speed or the volume of air more than 50% from maximum.

Many refinements in the control of ventilation have been obtained by the use of electric motors. Manual operation at the motor first was considered quite satisfactory and still is satisfactory in some cases.

Remote control from an engineer's office or from some centralized point has come into prominence within the past few years and is being used very extensively at the present time. Air conditioning in large buildings is under the control of a competent engineer and it is advantageous for him to control, from one centralized point, the exact air conditions in various parts of the building. This is accomplished by the installation, at such centralized point, of a device for starting and stopping a motor located elsewhere in the building, which device also indicates whether or not the motor is running.

This type of motor control involves the use of a pre-set speed controller located with the motor and actuated from the centralized point, the controller being manually adjusted for a predetermined definite speed. The fan motors are started and stopped from the engineer's room and operated at speed for which the controller has previously been set.

In addition to the pre-set speed controller, there has come into prominence a controller by which the fan may be started and stopped and also speed changes made from a push-button station located in the engineer's room. This push-button station consists of a stop button with three or more speed buttons and lights of different color to indicate at what speed the fan is running. In a large building where there are a number of ventilating outfits, the push-button stations usually are combined into one panel from which the entire operation of the ventilating system is controlled. In addition to this push-button station there are also, in the engineer's room, instruments that indicate the temperature, humidity, etc., at several points in the building.

In recent years serious consideration has been given to the importance of conditioning the air, as well as of supplying the proper amount. In some recent installations of proper air-conditioning and ventilation equipment, the windows are kept closed and natural ventilation wholly supplanted by an accurately-controlled circulation of the proper amount of pure air of correct temperature and humidity. The entire operation of the air-conditioning and ventilating system is under the control of a competent engineer.

The present trend is toward the greater use of automatic control of heating, ventilating and air-conditioning systems.

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## Is the Apartment Replacing the Small Home?

A STEADY trend away from one- and two-family homes toward apartment dwellings, not only in the larger cities of the country but in communities as small as those having 25,000 population, is reported by the United States Department of Labor. The inquiry has been raised in more than one quarter whether the single-family dwelling is soon to be nothing more than a memory in America.

In Milwaukee, figures compiled by Leon M. Gurda, city building inspector, covering the ten-year period from 1919 to 1928, inclusive, show that the percentage of Milwaukee families housed in apartments jumped from 23.20% in 1919, to 58.88% in 1928, and that in the same period the percentage of families housed in one- and two-family homes decreased from 66.85% to 41.12%.

An interesting point brought out by Mr. Gurda is the fact that, in 1928 the cost of single-family dwellings increased $1,352 over the cost of these dwellings in 1927. The cost of two-family dwellings increased on the average $670. Mr. Gurda draws the deduction that the more the cost of one- and two-family dwellings increases, and the more difficult and cumbersome the access to the commercial districts becomes, the greater will be the number of persons who will move into apartment buildings located near these centers.

# How Water Heating Has Advanced

THE application of a simple law of physics to the design of water heating systems represented the greatest single advance in water heating made during the first half of the past twenty-five years.

When the pressure on water is increased, the boiling point is raised. Water under atmospheric pressure boils at 212° but when the pressure is increased to 5¼ lbs. gauge, the boiling point is 228°. When this pressure is increased to 15 lbs., equivalent to a head of water 37 ft. in height, the boiling point is raised to 250°.

Water in an open heating system expands when heated, but since the volume increases, the pressure remains unchanged. When water is heated in a closed system not open to atmosphere, the expansion of the water results in the compression of the air in the expansion tank. This compression causes increased pressures in the system with consequent higher boiling points, affording a greater temperature range, increased flexibility, and makes possible the use of smaller radiators, pipes and fittings.

Closed systems, to obtain the desired increase in pressure, employed various types of valves to build up the pressure, and among the pioneers in this field were the A. W. Cash Valve Mfg. Company, H. A. Thrush & Company, Honeywell Specialty Company, Mueller Company, Kainer & Company, D. & T. Mfg. Company, and Kieley and Mueller, Inc.

One of the devices, a "heat generator," is shown in Fig. 1. This is connected at the side outlet to the water system and at the top to the expansion tank. Normally the bottom of the generator is filled with mercury, the remaining space being filled with water. When the water begins to expand it forces the mercury down into the mercury pot and up through the circulating tube. When the pressure reaches the high point for which the generator is designed, it is just sufficient to force the mercury out the top of the tube and allow the water to expand into the expansion tank.

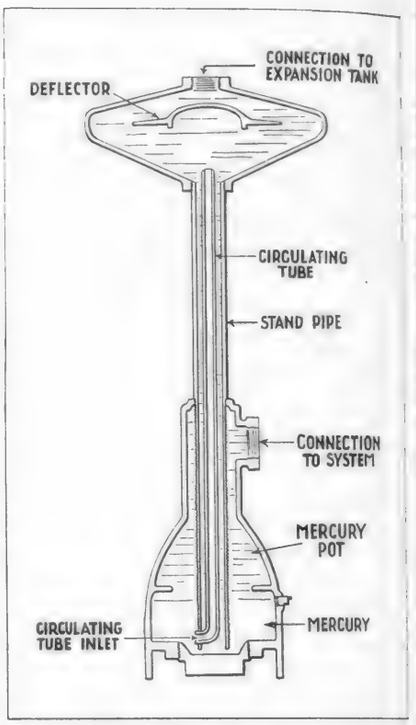


**Fig. 1. Mercury-Filled Generator Used in One Type of Water System**

Another device is shown in Fig. 2. Two valves are used with this system, an automatic pressure reducing valve and a pressure relief valve. The two valves are connected in the water supply line with the relief valve near the boiler and the city supply valve open. It is seen that with this type of valve, each time the relief valve opens there is a small loss of water, as the expansion is relieved back through the relief valve to the drain. Still other systems employ a sealed expansion tank which can be installed in the basement.

These descriptions are typical of the systems in common use for many years. It is necessary to design water systems carefully, as the motive power is necessarily slight. If the fitter installs the system carelessly, or if he runs in more elbows, tees, or smaller pipe than the plans called for, the system can be thrown out of balance due to the increased resistance in one part of the line. The necessity for careful design is greater with a water system than with any other type of heating system, whether the system is designed as a gravity or forced installation.

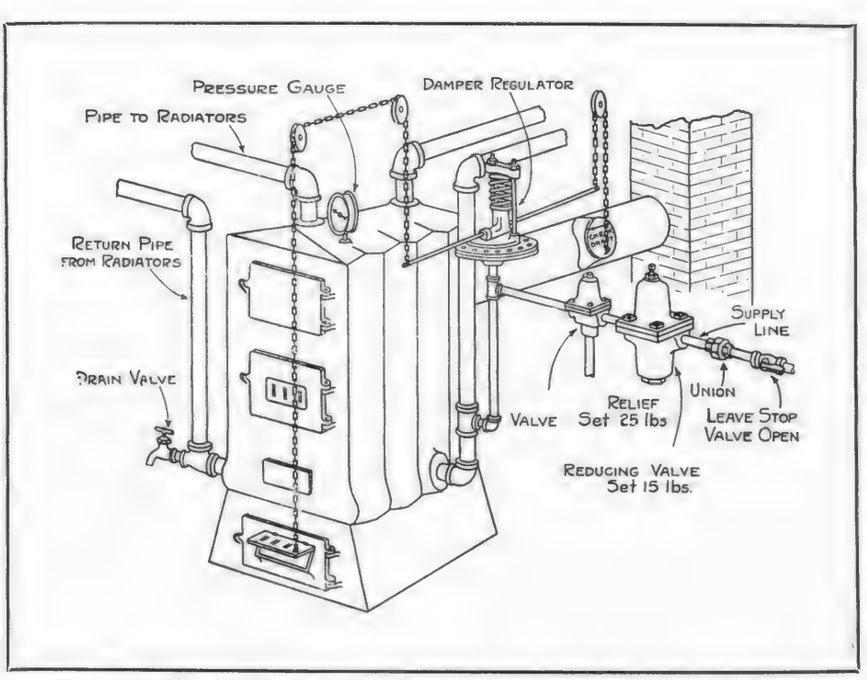


**Fig. 2. Boiler Connections for Modern Water Heating System**

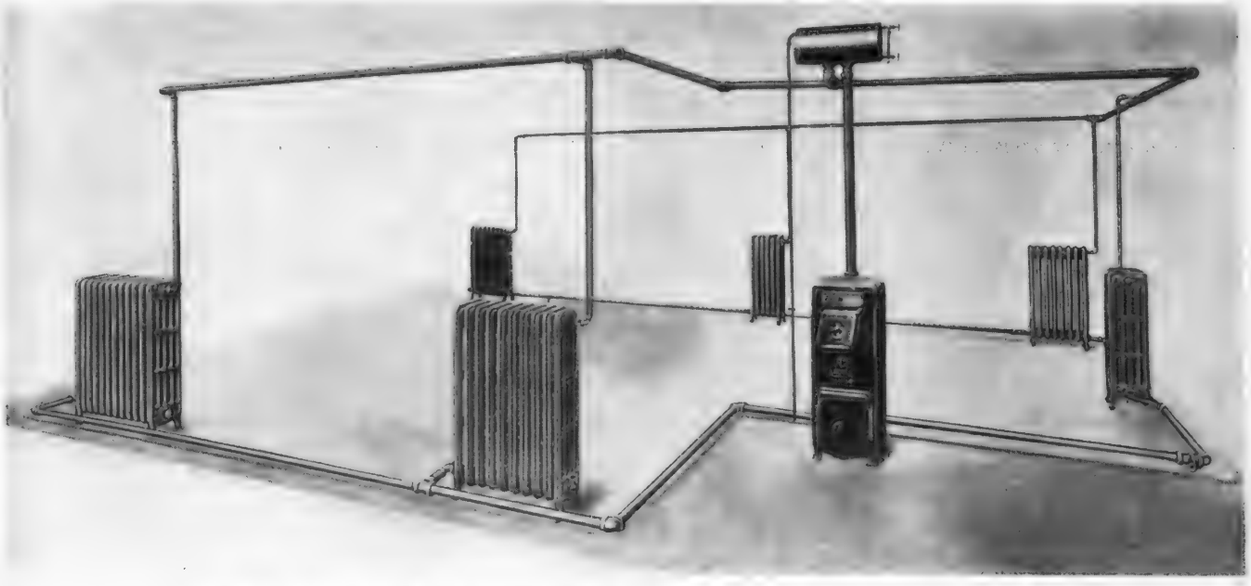

Fig. 3. Layout of Water System with Arcola Boiler on Same Floor as Radiators

To overcome this difficulty, an important addition to the line of heating specialties was made about five years ago when a system for equalizing the flow in forced water heating systems was produced. A packless radiator valve is so designed that after the system is installed, cartridge with multiple orifices can be inserted to produce the proper resistance in the circuit. Consequently, a water system can be installed to meet any of the conditions which arise during construction, and after the system is complete, the resistance can be calculated. Cartridges for various resistances are then specified and inserted in the valve.

A comparatively recent development in water heating is the use of devices to aid the circulation by mechanical means, either in the form of a propeller, impeller or special centrifugal pump. The use of pumps is by no means new in forced systems, but heretofore has been confined to installations especially designed for forced circulation. However, the devices referred to are especially intended to overcome the difficulties experienced by the contractor in the smaller installations, heretofore designed as gravity systems, and they also are popular for curing trouble jobs where circulation is sluggish.

Driven by electric motors, such devices can be controlled by a thermostat and also fit in nicely with the electric controls used with gas and oil-burning systems.

With one exception the progress made in water heating has been in the development of specialties. This exception is the small water boiler (Fig. 3) introduced a few years ago for small homes, stores, bungalows and the like. It can be used in buildings without basements, is nicely jacketed, and has done much to make water heating popular and to enable radiator heating successfully to compete with room heaters in installations where low cost is essential.

## The Future of Heating and Ventilating

*by* **George B. Nichols**

As we pass this twenty-fifth anniversary it is permissible to plan, in part, for the heating program for the next twenty-five years, based on the fundamentals established during this last period. The great outstanding features to be carried on are:

1. Systematic research in the field of science so as to develop the dreams of today into realities of tomorrow.

2. The standardization of fundamentals so as to reduce the sizes of finished products to the required minimum, thereby eliminating the waste of raw material and man's labor and releasing the unused materials and labor into other fields of usefulness.

3. The production of artificial mediums increasing human comfort, health, and making possible the manufacture of new or better grades of material which, in their turn, add to the benefit of the human race.

4. To place in record form the results of research so that actual use of these discoveries can quickly be put to a practical result and man can fly faster towards his dreamland.

As we pass on, however, it is a pleasure to know that man will never again be asked to go without the many heating and ventilating comforts made possible through recent inventions.

# Early Days in the District Heating Field

*by* **J. C. HORNUNG**

SOME folks stay in a certain industry or business because they like it, and some folks quit it because there isn't enough money in it. Well, maybe some of us stayed because we liked it.

As I look over the list of men who are now advancing the industry I find young men hardly thirty years old. They can't help that, but they are coming into a life work which is not only interesting but which enrolls them as one of the most beneficent factors in that long list of contributions that when all summed up make the daily life of a nation.

It was the day before Decoration Day, in 1900, when I landed right from college, at Belvidere, Ill., to join the forces of the W. H. Schott Company which was there installing a forced circulation hot water plant known as the Yaryan system. A. J. Stahl had the selling rights for this system. These men have now left the industry but their names are familiar to most of us, and on their early work and experiences we are still building.

The plant we were installing was a combination electric light and heating plant, but although my training was in electric engineering I somehow found myself in the construction gang that put in the heating plant and later followed observation on the operation of the plant, but having special reference to distribution and regulation.

There were no handbooks or rules in those days, so that we had to do a lot of exploring and some guessing. One illustration in figuring radiation comes to mind. It was the second floor in a store building with northwest exposure. Now the rule said: "So much for space, so much for glass and so much for walls." I measured everything very carefully and applied the little rule the same way. It wouldn't have been so bad if the contracts in those days didn't guarantee plenty of heat without any exceptions.

Anyway, the job went in and about the time service began the storekeeper on the first floor moved out and a telephone company took the second floor. Well, even in those days the telephone girls didn't wear blankets, and with no heat on the first floor to help out a little we kept adding radiation until we had about three times as much as was figured.

With heat selling on a square foot basis it was a very serious matter but it completely cured me from figuring radiation by a rule-of-thumb method. It also resulted in the development of a set of coefficients, the general form of which is now the standard as approved by the National District Heating Association.

A number of rather funny experiences migh be related. Of course, they are "old stuff" now, but there was a time "way back when" we didn't seem to know just why steam wouldn't go into a building or why hot water set up a howl in one building and not in another.

Well, steam seems to have a high coefficient of friction when traveling through a gunny sack stuffed into the service pipe where it connects to the main. Moral—Don't stuff gunny sacks in the end of mains at night when you leave the works.

The ever-present small boy may stuff it in a little farther for you after hours. Hot water is used so little now in district heating work that its distribution is to many a "lost art." For an art it often is to make the stuff go exactly where you want it and as quietly as you would have it.

One case comes to mind where in a certain home lived a lone lady whose favorite chair sat just over where the service entered the building. My instructions to locate the trouble and fix it was a sizable contract. After several days digging for possible throttles in the line it developed that the sound could not be heard at its source, but some 2000 ft. away just below the lady's favorite chair there was a delightful tune being played; that is, it might have been delightful if it had been played with the modern variation, but this one certainly got on the nerves.

Still another case was the same but altogether different. An elderly gentleman was called on one day to see how everything was going and a sizable little hum was heard in his service pipe. On evidencing some concern about the matter he said: "Young man, don't you touch that. I was raised along the coast of Maine and this is exactly like the ocean waves in my boyhood days. Don't you touch it."

In the day's work there are incidents which in themselves are trivial but which nevertheless add their bit to the sum total of experience. Our construction superintendent once was asked what to do with the extra earth to be removed under a house which had scarcely enough room to crawl under. "Dig a hole and bury it" was the reply.

Another time such a sage suggestion did not turn out so well. A coil was to be made in a small pipe to take care of expansion. The man, somewhat puzzled as to how this could be done with the means at hand, was told to wrap it around the telephone pole that stood right by.

Later on, the superintendent on his round found the man again puzzled. He had made the coil all right but asked the superintendent to take it off for him.

The underground construction of steam mains has been developed to a very high degree, both as regards efficiency and life. It might properly be said that heat mains laid underground away from inspection and surrounded by all the harmful elements, such as gas, acid, moisture and a world of physical strains, have brought into play considerably more than just plain engineering. But that is the way we progress in any service to mankind, and today the young men in the industry can go to their hand-

books and catalogs and buy a complete heating plant that works and forget about it.

The crazy idea that pipe has of coming right at you when it gets "hot under the collars" is all taken care of correctly and so is the fur coat around the pipe with a good rain coat on top of that. If you feel that you must lay a heat main in a boat, be sure that the boat doesn't leak, because if water gets to hugging too close, heat has such a liking to mix with the "wets" that it crawls right out through the pipe insulation and all and forgets to go on to keep its date with a nice little radiator.

Many interesting problems aside from installation were met and most of them "licked." One comes to mind concerning the efficiency of week-day steam as against Sunday steam. About 1903, occasion was had to see Mr. Green of Cedar Rapids, commonly known as Billy Green and, by the way, one of the best "advancers" the industry had in its early days. He said: "Why do I heat with less exhaust steam on week days than I do with live steam on Sunday?"

Well, quite a number of annual conventions of the National District Heating Association have argued this great question. Some said the "old man" lies around the house all day on Sunday and needs more heat. Others said that exhaust steam was "wetter" and that somehow made the heat units a little bigger. At any rate, they made a better showing when they got out into the room. That looks plausible but it was never proven and so the debate stands today. Maybe some of our younger acrobats or gymnasts in figures can tell us exactly + or — just how it happens.

The art of central station heating for it is an art, as well as an industry, stands today on a firm foundation and any one who attempts the recounting of "old days" would be remiss if the picture did not include such men as A. C. Rogers, first president of the National District Heating Association just twenty years ago; Mr. Wells and Mr. Bishop, of the American District Steam Company, both staunch pioneers and thorough believers in the industry; Mr. Schott, designer and builder of what was known as the Schott systems; Thomas Donohue, of LaFayette, the congenial "Tommy," and Mr. Meyer, of Terre Haute, who has regularly demonstrated for 25 years that hot water heat can be made to pay.

We must not come this side of the quarter-century mark, for there our list of those who have and are still contributing lavishly to the advancement of the industry would occupy pages, but we crave one exception and that is our very much esteemed D. L. Gaskill, of Greenville, O., who has been secretary of the National District Heating Association since 1910. Mr. Gaskill has faithfully guided the National District Heating Association ship, and while he hasn't had such very rough sailing we have a notion that he sometimes commanded the seas as well as the ship.

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## Report on Stoker Tests

The first of a series of reports based upon tests and investigations of anthracite burning equipment, heat control, ash removal devices, etc., has been issued by the Anthracite Operators' Conference, 120 Broadway, New York. The tests were performed by the Frost Laboratory at Norristown, Pa., and the first stoker tested was the Electric Furnace-Man. An H2R Electric Furnace-Man equipped with a large ring, was tested for several months in the laboratory and fully approved as an automatic stoking device, when properly installed in suitable heating plants, when burning buckwheat and rice sizes of anthracite.

The report states that the ratings, as published, of the various models of the Electric Furnace-Man stoker are based on the total equivalent direct cast-iron radiation connected to the boiler, but the information is for general guidance only, and definite recommendation concerning the size stoker to be installed in any boiler should be made only by sales agents of the device.

A definite statement was made that the laboratory passes judgment only on the stoker and is not responsible for the heating plant in which the stoker is installed. It is further said that while the stoker will efficiently and satisfactorily produce heat with anthracite or rice or buckwheat, it is not a cure-all for defective heating systems. The report concludes with a comparison of cost of operation of this stoker compared with heating with oil. For this purpose equal efficiencies were assumed for the burning of oil and coal, and the results calculated for various prices of oil and coal. A sample computation is given of an installation burning 8½-cent oil with a total consumption of 2550 gals. per season. An installation of this stoker burning $8 per ton buckwheat coal would require 15 tons per season with a total annual cost of $248 using the stoker, and $384.75 using oil, a net saving of $136.75 for the stoker for this installation.

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## Fifty-Million-Dollar Building Program

The accompanying illustration shows how Pennsylvania Avenue in Washington will appear after completion of the fifty-million-dollar government building program for beautification of the nation's capital. This illustration shows some of the buildings which will be seen when looking east from the Capitol. President Hoover has indorsed the program and is giving it his support.

**Model of Government Building Project in Washington, D. C.**

# Research Laboratory Outstanding Achievement of A. S. H. & V. E.

*by* **A. V. HUTCHINSON**

*Secretary, A. S. H. & V. E.*

**President**
**Thornton Lewis**

**Secretary**
**A. V. Hutchinson**

JUST ten years ago, in 1919, the American Society of Heating and Ventilating Engineers, after having been in existence for almost a quarter of a century, felt the need of having its own laboratory for research. As a result of several years' consideration and planning, the A.S.H. & V.E. Research Laboratory was established in the United States Bureau of Mines Building, in Pittsburgh, Pa.

It has the distinction of being the only institution of its kind supported by a technical society and devoted solely to research under the direction of a competent staff of engineers.

A portion of each member's and associate's dues (40%) is allotted to the Research Fund so that every society member shares in the work of the laboratory. Additional funds come from various allied organizations and from the industry so that the laboratory is generously supported.

Through the untiring work of those distinguished past presidents, F. R. Still and J. I. Lyle, and the great encouragement of the United States Department of Commerce, fostered by O. P. Hood, chief mechanical engineer of the Bureau of Mines, the laboratory started its active career, and has grown in power and prestige as the years have gone by.

From a rather modest beginning, the laboratory has branched out, and today 15 projects are under investigation. In addition to the Research Laboratory in Pittsburgh, under Director F. C. Houghten, cooperative agreements are in force with nine universities that have made their mark in some specific branch of research allied with heating and ventilating.

The cooperating institutions include:

University of Minnesota
University of Kentucky
University of Wisconsin
Texas Agricultural and Mechanical College
Carnegie Institute of Technology
Washington University (St. Louis)
Yale University
Harvard University
Purdue University

In a recent talk before the Philadelphia Chapter, Stewart A. Jellett, the society's first regularly-elected president, told of some of the organization's problems and pointed out that they had been solved by the daring of some of the old timers where now problems of similar character are submitted to research investigations.

The laboratory definitely has determined the precise reactions of human beings to various conditions of temperature, humidity and air movement, and has developed basic data, which have made possible the design and equipment of public buildings for maximum human comfort and health, a contribution to the world that can never be expressed in dollars and cents.

In the field of heat transmission, the laboratory's contribution has been the Nicholls heat meter, produced by that nationally-recognized scientist, Percy Nicholls.

In the investgation of dustiness in air, the Anderson-Armspach dust determinator resulted.

Our knowledge of the correct pipe sizes for steam heating systems has largely been standardized through the work in the laboratory, and much new knowledge has been added on the effectiveness of weatherstrips, and the value of various building materials to reduce heat losses through experiments carried out at the laboratory and under its supervision.

In 1919, it is doubtful whether the little group of serious-minded engineers who sponsored the laboratory, could foresee its rapid expansion, nor could they know how high a place it would reach in the esteem of scientists, and how much its output has influenced the well-being of civilized mankind living and working mostly indoors.

The work of the laboratory and its success has resulted from the leadership of the Research Committee Chairmen such as J. I. Lyle, F. R. Still, Thornton Lewis, W. H. Driscoll, H. P. Gant and S. R. Lewis, to name a few, and such directors of research as the late beloved John R. Allen, F. Paul Anderson and F. C. Houghten.

All of the groundwork in establishing the society on a firm foundation and preparing the way for its present extensive activities is inseparably connected with such men as Hugh Barron, L. H. Hart, the Mackay brothers, Prof. William Kent, Prof. R. C. Carpenter, and others who have passed on.

(Upper left) Measuring and Analyzing Exhaled Breath of Subject to Determine Rate at which Heat and Moisture Are Added to Atmosphere.

(Center left) Determining Condensate of Radiator under Controlled Conditions.

(Lower left) Measuring Air Leakage through Stucco on a Frame Wall.

(Upper right) Weighing Subject to Determine the Rate at which Humans Lose Weight and Heat.

(Center right) Determining Effect of Passage of Time on Conductivity of Concrete Slab.

(Lower right) Measuring Condensate in a Study of Capacities of Steam Mains and Risers.

President
John W. Meyer

# National District Heating Association

*by* **D. L. GASKILL**

Secretary
D. L. Gaskill

CONVEYING heat through some medium transmitted in pipes has been in vogue for over a half-century. The successful and profitable operation of such systems can be brought down to almost within the past decade. There were so many problems to be considered in the transmission of heat and so few people or companies were willing to undertake to solve such problems that the industry languished very much in its early inception.

Loss of heat in transmission, effect of expansion and contraction, lack of good insulating materials and a rather limited knowledge of the operation of steam used for that purpose, all were problems that up to the past two decades were unsolved.

On account of the ease of conveying water by means of pumps, some of the pioneers in the industry decided that hot water was the easiest method to transmit heat and promised the best solution of the district heating problem. All methods of heating at that time, however, were crude, and the method of selling the heat was still more crude and untried.

The square foot of heating surface in the radiator offered the easiest solution of the matter and that method of selling the product by charging a fixed amount per square foot of radiator surface was pretty generally followed by all of the pioneers. Possibly the business was so small that no one gave very serious consideration to the best method of selling the product, and losses which most generally occurred were absorbed in some other branch of the operation of the company so distributing heat.

By 1905, there had been enough companies operating to bring about a general knowledge that the business so far was unprofitable and that something would have to be done to put the business on a basis that not only would bring about an equitable plan for measuring the heat sold, but also give sufficient data to enable the operating companies to determine where their losses were occurring.

In 1909, at a convention of the Ohio Electric Light Association, which was being held in the city of Toledo, O., some six men, who mostly were engaged in operating hot water plants, got together in an afternoon conference and decided that the time had come to organize an association which should consider and deal with the problems of district heating. These men were Col. D. J. Hard, president, Cleveland Light & Power Co., Cleveland, O.; W. A. Wolls, Columbus Railway, Power & Light Co., Columbus, O.; Edwin F. Gwynn, Delaware Electric Light & Power Co., Delaware, O.; A. C. Rogers, The Toledo Railways & Light Co., Toledo, O.; and two others whose names I do not recall at this time, but all of them from Ohio.

At that conference it was decided to hold a convention in the city of Columbus, in October, 1909, and determine if the district heating industry had not reached a point where it should have an association of its own. The convention was held at the Southern Hotel, Columbus, O., in October, 1909. At this meeting there gathered some fifteen men engaged in the heating business and some fifteen representatives of the manufacturing companies that were interested in supplying material and supplies for such industry.

After the first day's session it was decided to establish an association which should be known as the National District Heating Association, the object of which should be to gather data and information along the lines of that particular industry. The writer received a telegram on the evening of the first day of the meeting asking him to come to Columbus and meet the association the next morning. With no knowledge of what was wanted, he went to Columbus and found the association looking for a secretary. He reluctantly accepted the appointment for one year with the distinct understanding that he was to be relieved from any work at the end of the year, but that he would give of his time and experience to make the infant association a success, if possible.

The work was begun and the secretary, at his own expense, published the proceedings of the Columbus convention in a very thin cloth-bound volume. The possibilities of the business and the keen interest displayed by those who were engaged in it kept the secretary at his position, and he still is secretary of the association.

From a mere handful of members the association now has 350 with a gross annual income from heating of over $100,000,000, and a property investment of over $500,000,000.

This short history will not permit a detailed statement of the wonderful development and discoveries that have been made in the twenty years that the association has been operating. Suffice it to say, that every year has been full of interest and productive of new discoveries that have made the business possible and profitable.

Hot water for district heating was passed and eclipsed by steam and the real reason of such abandonment of

hot water and application of steam was the possibility of measuring the steam product by either flow meters or condensation meters. This was the most important step in the industry as it enabled the companies to charge and receive an adequate sum for the heat which would be measured by the amount that was consumed and used. It has brought about very complete data as to the consumption of heat in various classes of buildings, and, of late years, one of the foremost objects of the association has been to work out plans and methods for the conservation of heat so as to give the customer the heat required at the lowest possible cost.

The World War with its constant increases of cost of fuel brought consternation to the managers of the heating companies. Yet this is the best thing that could have happened to the business as it resulted in a complete recasting of the rates charged for heating and brought them to a profitable point. Since the war has passed and the period of deflation is well over, these rates have been kept at a point that have paid a reasonable profit upon the property used in the operation and conduct of the business.

Much of the splendid work of the association has been accomplished by standing committees selected from utilities that were engaged in the work. These men have given unstintingly of their time for the solution of the problems and it is probable that no other association has performed better committee work than that of the N. D. H. A.

Judging from the present outlook, it is only a question of time until all of the business districts of the larger cities will be served by district heating. Elimination of smoke, getting rid of fuel and labor troubles all tend to drive the heating business to the district heating company. Owing to the cost of the installation of systems, the heating of individual residences has not grown or been encouraged, but the heating of apartment buildings, together with business buildings has been a complete success from every standpoint.

The association is prosperous. Its object has been carried out and the future promises great usefulness for the industry.

# N. D. H. A. Convention Program

THE Detroit Edison Company will be the hosts to the National District Heating Association at the association's twentieth annual convention, to be held at the Hotel Statler, Detroit, June 11-14.

An innovation will be introduced by the station operating committee. After this committee gives its report, a round table session will be devoted to a discussion of important problems of station operation. The round table will be under the direction of the chairman, E. E. Dubry.

The program follows:

### June 11, 10:00 A.M.

Welcome to the city, A. C. Marshall, vice-president and general manager, Detroit Edison Company.
Response to welcome, D. L. Gaskill, secretary, National District Heating Association.
President's allocution, John W. Meyer, Philadelphia Electric Company.
Our financial condition, D. L. Gaskill.
Report of Executive Committee, by the secretary.
Educational Committee—Report of the work and lines that should be followed in the future, J. H. Walker, chairman.
Report of Development Committee, John W. Meyer.
Report of Manufacturers' Section.
Appointment of Nominating and Convention Committees.

### June 11, 2:30 P.M.

Report of Station Operating Committee, E. E. Dubry, chairman, The Detroit Edison Company, Detroit.
COVERING:
Relation between the steam heating and the electrical departments.
Method of determining size and location of plants.
Spare plant capacities and transfer of loads.
Is the tendency toward higher pressures?
What is being done to eliminate smoke and cinders?
What do you do to improve your plant load factor?
How do you determine your maximum plant loads?
Discussion of cycle of steam and water and installation of boiler plants.
Discussion of diagrams showing distribution of heat.
"Figures never lie."
Round table discussion on station operating.
Operating Statistics Report, J. C. Butler, chairman, Illinois Maintenance Company, Chicago.
Address—Recent Developments in Heating and Ventilating Practice, Prof. A. C. Willard, head of department of mechanical engineering, University of Illinois, Urbana, Ill.
Report on National Piping Standards and Codes Affecting District Heating, Sabin Crocker, The Detroit Edison Company.

### June 11, 8:30 P.M.

Report of Commercial Relations Committee, L. S. Smith, chairman, Rochester Gas & Electric Corp., Rochester, N. Y.
Address—Customers' Relations, Miss S. M. Sherman, vice-president and sales manager, The Detroit Edison Company.

### June 12, 9:30 A.M.

Report of Rates and Regulations Committee, E. L. Wilder, chairman, Rochester Gas & Electric Corp., Rochester, N. Y.
Research Committee and Its Investigation, F. B. Orr, chairman, Illinois Maintenance Co., Chicago.
Address—Thermodynamics of District Heating Operations, Dean A. A. Potter, Purdue University, Lafayette, Ind.
Manufacturers' Round Table.

### June 13, 9:30 A.M.

Report of Hot Water Committee, S. F. Delaney, chairman, Atlantic City Electric Co., Atlantic City, N. J.
Distribution Committee Report, Edward Lenz, chairman, New York Steam Corp., New York.
Address—Forecasting City Development, J. Rowland Bibbins, Washington, D. C.

### June 14, 9:30 A.M.

Meters and Accessories Committee Report, J. J. Schenk, chairman, Rochester Gas & Electric Corp., Rochester, N. Y.
Promotion Committee Report, John L. McCullough, chairman, Allegheny County Steam Heating Co., Pittsburgh, Pa.
Election of Officers.

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## A.G.A. Convention Expected to Break Records

A convention and exhibition which will far eclipse anything held in the past is expected by those in charge of the 11th annual convention of the American Gas Association, to be held in the Municipal Auditorium at Atlantic City, N. J., October 14-18.

Both the convention and exhibition will be housed in the new auditorium, which occupies an entire block of seven acres. The auditorium will be opened in June with the Golden Jubilee of Light and will continue until the American Gas Association convention. A brilliant lighting display will be conducted throughout the resort and on approaching highways.

The convention will occupy over 75,000 sq. ft. of space and advance indications point to the largest exhibit of gas appliances and equipment ever held by the industry.

The members of the exhibition committee are: Chairman, H. Leigh Whitelaw; K. C. Farnsworth, Stanley Little, Fred A. Miller, Harry P. Roth, and C. W. Berghorn.

President
James M. Triggs

Research Residence Built by National Warm-Air Heating Association at Urbana, Ill.

Secretary
Allen W. Williams

# National Warm-Air Heating Association

*by* **CLARENCE M. LYMAN**

*Honorary Chairman, Research Committee*

MY earliest recollections of the National Warm-Air Heating Association, which certainly go back to the days when the association was young, were of sitting on the side lines and listening to a Niagara of opinionated talk based almost entirely on the personal opinions and varied experiences of individual manufacturers with as many diverse views as there were shades in Joseph's coat.

These opinions were expressed with a dogmatism that promised little chance of harmony in action. That the association in those critical days functioned at all and succeeded in welding the manufacturers into a strong, cohesive organization is due to the wise selection of the presiding officers and their far-seeing vision.

Others may not wholly agree with me, but three outstanding events in my judgment are responsible for the present high standards and success of this association:

1. We were drawn into the World War.

2. Prof. A. C. Willard was brought in to advise the manufacturers.

3. The National Association of Sheet Metal Contractors planned a warm-air furnace code for its members.

Our entry into the World War as a nation called for the mobilization of materials, as well as men, and when the authorities at Washington demanded information regarding the number of warm-air furnaces that could be furnished within a given period for camps, munition towns, shipyards, etc., the furnace manufacturers just had to get together and counsel with one another. Perhaps I am wrong, but it seems to me this marks the birth of that spirit of cooperation so manifest now.

Then Professor Willard, in his wise, whimsical way, outlined some of the things that we ought to know if we were to handle this unusual, new demand in a scientific, engineering manner. And the sheet metal contractors, through J. Harry Hussie and others, told us in no uncertain terms that unless we could produce a better code than the one outlined by them they should stick to theirs.

Do not gather that these three outstanding events occurred at the same moment; they did not, but I am not trying to date and label these notes.

In 1918, the War Industries Board sent out an S.O.S. call for a warm-air heating advisor in the Building Materials Division. I have always considered it one of the highest compliments I ever had paid me that the officers of this association recommended that I be asked to take that position.

For a group of manufacturers to be willing to select an active competitor to represent them certainly can be considered a high honor. I am glad here and now to make this acknowledgment of my appreciation.

In Washington, at that time, the Building Material Section of the War Industries Board was bending all its energies toward the preparation of standardized specifications that should apply to all the projects then

being carried on by separate departments.

The signing of the Armistice brought this work to a sudden termination, but a mass of building data had been assembled and correlated, including heating specifications, that would be of great value if distributed today. Indeed, a volume of this was printed and bound, but, for some reason which I have never learned, its distribution was held up.

Professor Willard's counsels and suggestions led to a cooperative agreement about this time with the University of Illinois for an investigation of warm-air furnaces and furnace heating systems. Research work was begun in October, 1918, and has been carried on steadily ever since.

Some pet theories that many of us held have rudely been upset, but, as a result, warm-air heating claims its position now on a sound engineering basis with a wealth of data prepared by the University of Illinois available for every one.

Perhaps the most outstanding development has been the evolution of the Standard Code and its companion, the Standard Ordinance Form. Credit for this does not belong alone to the National Warm-Air Heating Association. Its inception started with the National Sheet Metal Contractors, but at Chicago, in 1921, representatives of the American Society of Heating and Ventilating Engineers, The National Sheet Metal Contractors, the Western Furnace & Supply Association, united with this association in appointing a sub-committee to prepare and submit a code.

The wise leadership of this group fell on Prof. J. D. Hoffman, of Purdue University and too much praise cannot be expressed of the manner in which he has directed this work.

Many will remember vividly the criticism and objections that were expressed when the committee's first report was submitted. There were about as many conflicting ideas and dogmatic opinions then as now assail the tariff bill in Congress.

The first edition, published in October, 1922, met with instant approval, but changes have been made as new editions have been published. The sixth, issued March, 1929, is nearly standardized.

No claim is made that it is perfect or even complete, but it is so simple and practical that any contractor following it can absolutely guarantee the satisfactory working of the job. The owner or architect who writes into his specification that the work "must comply with the Standard Code in every detail" will be assured of a fire-safe job, correctly installed and that will operate efficiently and economically.

All this is looking backwards. We are far more concerned with the future.

If the National Warm-Air Heating Association goes forward in the future as in the past, with a mutual spirit of helpfulness and cooperation, and an earnest effort to continue to improve heating conditions, warm-air will hold, as it should, a leading place in home installation.

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## Volume Sales and Price Cutting

That the desire for large volume sales is responsible for price cutting and low profits was an important point brought out at the 20th annual convention of the National Pipe & Supplies Association, held at the William Penn Hotel, Pittsburgh, May 13-15.

Nearly 900 were present at the conference, during which Clarence F. Harvey, of A. Harvey's Sons' Mfg. Co., Detroit, was elected president for the coming year. J. Harvey Borton, Hajoca Corp., Philadelphia, was elected first vice-president, and J. C. McEwen, of The Davies Supply Co., Chicago, second vice-president.

C. F. Cruciger, general sales manager of Spang, Chalfant & Co., Inc., in a talk on business conditions in the steel pipe industry, stated that volume sales were the cause of most of the industry's troubles, and further said that, although continuous operation is productive of lower costs, if the country cannot absorb the goods produced, there is bound to be trouble ahead.

Speaking on the subject of wrought-iron pipe, H. F. Mattern, general sales manager of the Reading Iron Company, deplored price cutting in the industry and claimed that this condition is due to the craving by manufacturers for volume instead of profit. William H. Utz, general manager of sales, Jenkins Bros., talked on the subject of valves. He made a strong plea for better cooperation between manufacturers wholesalers, and contractors, so that a better price might be obtained for quality merchandise.

H. W. Seymour, general sales manager, Crane Company, said that the industry had nothing to fear from the direct selling companies. That business in the boiler and radiator industry is good, was the essence of a talk by W. M. Gosgrove, vice-president of the American Radiator Company.

The first day of the convention was devoted to golf, the second to business sessions, and the third to the Trade Practice Conference under the direction of Federal Trade Commissioner Charles H. March.

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## Need for Standardization of Sheet Metal Gages

The American Standards Association has made public a letter from Professor Townsend of the Massachusetts Institute of Technology which expresses the need for a standardization of gage systems used for the measurement of sheet metal and wire. Professor Townsend says, in part:

"An informal canvass of my associates indicates that almost any consolidating change in the existing gages would be far more desirable than the present state of affairs. They seem to feel that the expression of sheet and wire sizes by the decimal sizes, alone, would be the first logical step. After that overlapping sizes in the various systems (especially when the tolerances are considered) would be more or less automatically eliminated. . . .

"The general feeling among the electrical engineers is that it would be very desirable from their standpoint to have the wire in sizes which would give even units of circular mils. However, this idea has been mentioned as unimportant when compared to the major question of establishing a new and simple wire gaging system. Several suggestions have been made to this effect: One sheet metal gage, such as the U. S. Standard, and one for wire such as the B & S or American gage."

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## Gas House-Heating Grows in West

An indication of the growth of gas house-heating is furnished by the report from the Cities Service Companies, which, for the year 1928, made house-heating installations whose consumption total more than a billion cubic feet of gas annually.

The various units of the Cities Service Companies installed gas-fired central house-heating units as follows: Gas Service Company, 2851; Public Service Company of Colorado, 2396 in Denver alone; Pueblo Gas & Fuel Company, 550; Dominion Natural Gas Company, operating in Ontario, Canada, and western New York, 435.

E. M. Fleischmann
1929

J. C. Johnson
1928

L. L. Jacobs
1926-7

C. H. Chalmers
1925

E. P. Bailey
1924

Wallace C. Capen
1923

# American Oil Burner Association

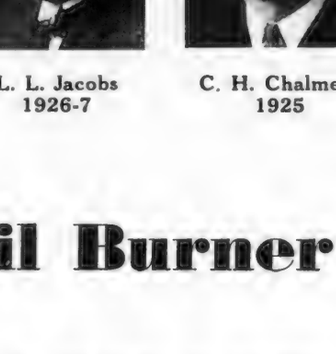
*by* **HARRY F. TAPP**

*Technologist,*
*American Oil Burner Association*

"TO foster the interests of the oil-burner industry; to promote and protect the industry by using all just and legal methods for obtaining fair and reasonable laws, ordinances and regulations; to promote a spirit of amity and cooperation among its members; to correct abuses caused by unfair competitive methods or unethical trade conduct; to collect and disseminate accurate and reliable information and statistics from and among those engaged in the industry; to settle differences between its members, and to promote a larger and more friendly intercourse and a closer union and more cordial cooperation among those engaged in the industry," the American Association of Oil Burner Manufacturers was organized in Chicago, September 7, 1923.

At the first meeting, held at the Congress Hotel, twelve charter members, eight manufacturer members, and four associate members took part. Wallace C. Capen, of the Home Appliance Corp., St. Louis, was chosen as president, Leod D. Becker, editor of *Fuel Oil*, was appointed acting secretary, and temporary headquarters were established at Galesburg, Ill.

The members who "signed up" at the first meeting were: Home Appliance Corp., now Electrol, Inc., of Missouri, St. Louis; National Airoil Burners Corp., Philadelphia; Peabody Engineering Corp., New York; Wayne Tank and Pump Co., Ft. Wayne, Ind.; Tiffany Oil Burner Co., Paterson, N. J.; Aetna Automatic Oil Burner, Inc., Providence, R. I.; Oliver Oil Gas Burner, St. Louis, and the Gill Mfg. Co., Chicago. The associate members were the Federal Gauge Co., Chicago, now the Mercoid Corporation; Honeywell Heating Specialty Co., Wabash, Ind.; Minneapolis Heat Regulator Co., Minneapolis, Minn.; and *Fuel Oil*, Galesburg, Ill.



Trell W. Yocum, Executive Secretary

Following closely upon the formation of the national body, the organization of the Chicago Oil-Burning Club was effected January 15, 1924, at the Virginia Hotel. Over 100 oil-burner manufacturers and their representatives and representatives of oil-producing companies attended this meeting.

The first annual meeting of the national association was held in St. Louis, April 1-3, 1924. The attendance was over 200, and 32 manufacturers exhibited their products. The May, 1924, issue of THE HEATING AND VENTILATING MAGAZINE, in reporting the convention, stated that the discussion following H. W. Sweatt's paper on "Temperature and Safety Controls for Oil Burners," brought out the point that "in selling oil burners too much emphasis should not be placed on the operating costs, but that instead burners should be sold on the basis of cleanliness and convenience." A study of present-day catalogs and sales talks will show how well this idea has been adopted.

At this convention, Edward P. Bailey, of the National Airoil Burner Co., Philadelphia, was elected president, and Wallace Capen, C. H. Chalmers, R. P. Flower, John Scheminger, and H. A. Tiffany were elected to the board of governors.

In July, 1924, the association, at the request of the Western Petroleum Refiners' Association, named a committee to conduct a series of tests on domestic oil burners at the Bureau of Mines at Bartlesville, Okla. P. S. Russell, A. N. Eaton, and C. B. Finnell were named on this committee.

At the second annual convention, held at Chicago, April 1-3, 1925, the name of the association was changed to the American Oil Burner Association. At this convention it was decided to employ a technologist, and J. T. B. Bowles, formerly with the Tidewater Oil Co., New York, was chosen for this position. C. H. Chalmers of the Chalmers Oil Burner Co., Minneapolis, Minn., was elected president.

The new constitution, adopted at the third annual convention in De-

troit, 1926, provided for the formation of a dealers' division, and provision was made for the election of three of the fifteen directors by this dealers' division. Oliver Ward, of Rutland, Vt., was made temporary chairman of the division. Lionel L. Jacobs, of Fess Oil Burners of Canada, Ltd., was elected president for the year. The growth of the interest in the association is shown by the attendance records, the number of delegates and visitors being over 900.

During the year 1926, the association issued two publications, one being the bulletin on "Testing Methods" and the other the "Handbook of Domestic Oil Burning," the latter being issued in July. The association, throughout its six years of existence, has made several market and sales investigations, and, in 1926, it conducted a sales stimulating campaign for the purpose of obtaining a greater public acceptance of oil heat. The results of this campaign led to the organization of the Oil Heating Institute in April, 1927.

An important move was made at the fourth convention when the board of directors adopted a resolution increasing the membership from 16 to 27 members, six of whom represented the dealer division. Lionel L. Jacobs was re-elected president at this convention, held at Buffalo, April 5-7, 1927. Nearly 800 representatives from member companies and 1400 visitors attended the convention. A plan was adopted at this time proposing the expenditure of a large sum to be raised by voluntary contributions from the members, as the basis of an advertising campaign to sell the public on oil heating. On October 31, 1927, the association was incorporated.

Nearly 75 manufacturers exhibited at the fifth convention held at the Hotel Stevens, Chicago, April 3-5, 1928, and 1845 delegates registered. J. C. Johnson, president of the S. T. Johnson Co., Oakland, Calif., was elected president. A review of the activities of the association for the preceding year showed that nearly 17,000 inquiries regarding oil burning had been received and answered, and that as the result of the publishing of a special booklet for architects, correspondence had been initiated with 4000 architects who evinced an interest in oil burning.

In October, 1928, the association adopted a code for oil-burner advertising. The code discourages the use of extravagant generalities and disparaging statements regarding competitors' burners. The chairman of the committee which formulated the code, which the members agreed to follow, was Haldeman Finnie, and the code represents an accomplishment which the association views with considerable pride.

During 1928, the association, in cooperation with the Underwriters' Laboratories, American Society for Testing Materials and the American Petroleum Institute, agreed on a set of standards for furnace and fuel oils. After the adoption of these standards, the commercial standards unit of the Bureau of Standards was contacted. A trade conference called in January, 1929, resulted in these specifications, with minor changes, being proposed as the official commercial standards. Acceptances received up to the present time from burner manufacturers, refining companies, and major users practically assure their adoption.

A greatly improved and enlarged edition of the "Handbook on Domestic Oil Burning," by Harry F. Tapp, was published in 1928. The association also has issued an accounting manual for oil-burner dealers, monthly bulletins and convention papers, and miscellaneous mailing literature.

Trell W. Yocum was chosen as managing director during 1928, and assumed his duties October 1. Under his direction the Oil Heating Institute has been incorporated and the publicity of the association and the institute given wider circulation than ever before.

Every year the attendance record at the annual convention has been broken, and the convention in April, 1929, was no exception. Over 3000 delegates and visitors were registered, and 60 manufacturers exhibited at the exposition, confined to members. At the meeting this year, E. M. Fleischmann, president of the May Oil Burner Corp., Baltimore, was elected president of the association to serve for the coming year.

A model ordinance, covering the installation of burners and the storage of oil fuel was issued by the association for the guidance of cities and communities contemplating a new ordinance or the revision of existing ordinances. Through this work conditions in many important oil-burning centers have materially improved.

In its efforts to increase the use of oil burners, improve conditions existing in the industry, and promote relations with other bodies and organizations for the mutual advantage of each, the association is actively cooperating with the National Fire Protection Association, Underwriters' Laboratories, American Petroleum Institute, American Society of Heating and Ventilating Engineers, American Society for Testing Materials, National Electric Light Association, United States Chamber of Commerce and the United States Department of Commerce.

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## A. O. B. A. to Participate in Heating and Ventilating Exposition

Word has been received that the American Oil Burner Association will cooperate with the American Society of Heating and Ventilating Engineers, in connection with the forthcoming International Heating and Ventilating Exposition to be held in Philadelphia, January 27-31, 1930, in connection with the next annual meeting of the A.S.H. & V.E.

At the April meeting of the directors of the A.O.B.A., the association's secretary was instructed to endeavor to obtain an option on space that can afterwards be allotted to A.O.B.A. members.

This action will insure a comprehensive display of oil burners at the exposition, which will add much to its interest.

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## Mechanical Type Burners Should Have Draft Control

In a report of the American Oil Burner Association's annual convention, in THE HEATING AND VENTILATING MAGAZINE for May, on Page 90, the statement was made that the conclusions of the paper by J. L. Breese, Jr., were to the effect that "all natural-draft burners should have draft control, but that no blower type burner should be so equipped."

The statement should have read that all natural-draft burners and all mechanical burners without a blower should be equipped with a draft regulator and that no blower burner can operate efficiently without draft control unless great pains are taken to seal up every crack in the boiler at least once every year.

# Heating and Piping Contractors National Association

President
Walter Klie

*by* **JOSEPH C. FITTS**
*Assistant Secretary*

Secretary
Henry B. Gombers

HEATING and Piping Contractors National Association began its existence in Chicago, Ill., at the Hotel Leland, in September, 1889. There were in attendance fifty-one master steamfitters from fifteen states and they organized the National Association of Master Steam and Hot Water Fitters. This name was changed to the Heating and Piping Contractors National Association in 1919.

It took optimism and foresight for these few pioneer members to organize a national association. There was nothing tangible that could be offered to induce membership beyond the indirect results which were bound to benefit every individual member as the result of uplifting the craft in general. Yet there was much to be done and those men put their shoulders to the wheel to accomplish it.

Friendly cooperation took the place of the intense antagonism that formerly existed. All worked together for the improvement of the lot of the heating contractor which, at times, was not a very happy one.

During the first few years the need of a constant flow of information from the central office to each member was realized and the *Official Bulletin* was established in 1894, and has served continuously since that time. It has been the means of carrying the news of the work of the national association to all those interested in the heating industry.

Studies of overhead, cost estimating, protection of the industry through watching closely legislation, and standardization of materials and methods, which was begun in 1894, are achievements of the association which have gone a long way toward making the heating industry an orderly and properly conducted business.

The standardization program has increased rapidly with the passing years. In the dimensional standards the association has been joint sponsor with the American Society of Mechanical Engineers and the Manufacturers Standardization Society of the Valve and Fittings Industry for the standardization of pipe flanges and fittings. This group, working under the procedure of the American Engineering Standards Committee (now known as the American Standards Association) has completed the following projects:

Cast-iron flanges and flanged fittings for maximum pressures of 125 lbs.

Cast-iron flanges and flanged fittings for maximum pressures of 250 lbs.

Malleable-iron screwed fittings for maximum pressures of 150 lbs.

Cast-iron screwed fittings for maximum pressures of 125 and 250 lbs.

Steel flanges and flanged fittings for maximum pressures of 250, 400, 600, 900 and 1350 lbs.

This group has still five projects under consideration:

Cast-iron flanges and flanged fittings for maximum pressures of 25 lbs.

Cast-iron long-turn fittings (screwed and flanged) (for sprinkler service).

Cast-iron flanged ammonia fittings.

Cast-iron screwed ammonia fittings.

Face-to-face dimensions of ferrous flanged valves.

The Committee on Standardization of the association has eliminated the confusion existing in roughing-in for radiators and established standard roughing-in dimensions for radiator supply valves, modulating valves and return-line vacuum traps. In this work they had the active cooperation of the Manufacturers Standardization Society of the Valve and Fittings Industry.

In the field of welding, the association's Sub-Committee on Welding has succeeded in designing a standard welding neck flange which makes it possible to use flanges in welded lines with a single weld and without fear of distortion of the face. These are now being manufactured and are in use by the members.

But this dimensional standardization has formed only a small part of the work of the Committee on Standardization. In the field of design the work of this committee has been even more far-reaching.

The Heating and Piping Contractors National Association Engineering Standards was begun in 1919. Part I, "How to Figure Radiation," was published in 1923, and the first of the Standard Radiation Estimating Tables appeared in 1924. Since then Part II, "Selection of Boilers," and Part III, "Pipe Sizes," have been added to the book and furnish standards for all the important parts of a heating system.

Based on these standards, the Committee on Certified Heating has built up a merchandising program which is a modern expression of the ideals of the business world. Through this program the building public is as-

sured of properly engineered and installed jobs in the buildings in which members of the association install heating plants.

"Certified Heating" is spreading throughout the country like a prairie fire and it is freely predicted that there will be national distribution of this method of selling heating installation before the end of 1929.

# Heating Contractors Association to Celebrate 40th Birthday

THE fortieth birthday of the Heating and Piping Contractors Association will be celebrated at the annual convention in the New Hotel Jefferson, St. Louis, Mo., June 10-13.

Among the important papers on the program are several by nationally known authorities, including "Better Business through Better Trade Relations," by Dr. Hugh P. Baker of the Chamber of Commerce of the United States; "A Credit Plan for Extension," by Nicholas J. Biddle, Allied Construction Industries, Inc.; "The Future of the Heating Industry," by Russell G. Creviston, Plumbing and Heating Industries Bureau; "Pipe Welding in the Heating Industry," by John H. Zink, chairman of the sub-committee on welding, and "Market Research Applied to the Heating Industry," by E. L. Flentje, research division of the Plumbing and Heating Industries Bureau. In addition to these will be the usual interesting and important reports from the committees and sub-committees.

The complete program follows:

### June 10

10:00 A.M.

Meeting of the Board of Directors.
Meeting of Secretaries' Conference.

2:30 P.M.

Address of welcome, Mayor Victor J. Miller, St. Louis.
Welcome to St. Louis, The St. Louis Association.
President's address, Walter Klie.
Appointment of Convention Committees.
Better Business through Better Trade Relations, Dr. Hugh P. Baker, manager, trade association dept., United States Chamber of Commerce.

6:30 P.M.

The Old Guard Dinner.

8:30 P.M.

Get-Together Party.

### June 11

9:00 A.M.

Report of Chairman of Board of Directors, Frank W. Howard.
Report of Treasurer, Horace W. Jones.
Report of Auditing Committee.
Report of National Headquarters, Joseph C. Fitts, assistant secretary.
The Future of the Heating Industry, Russell G. Creviston, general manager, Plumbing and Heating Industries Bureau.
A Credit Plan for Construction, Nicholas J. Biddle, general manager, Allied Construction Industries, Inc.
Report of Committee on Standardization, Ralph S. Franklin, chairman.
Report of Sub-Committee on Boiler Output, George M. Getschow, chairman.
Report of Sub-Committee on Depreciation, William W. Hubbard, chairman.
Report of Sub-Committee on Welding, John H. Zink, chairman.
Textbook on Welding, S. Lewis Land, educational director, Plumbing and Heating Industries Bureau.
Discussion of Report of Committee on Standardization and Its Sub-Committees.

2:30 P.M.

Sightseeing trip.

7:00 P.M.

Theater party.

### June 12

9:00 A.M.

Report of Membership Committee, E. W. Verity, chairman.
Discussion of Report.
Report of Committee on Bylaws, Herbert A. Snow, chairman.
Discussion on Report.
Pipe Welding in the Heating Industry, John H. Zink.
Humidity in the Home, Walter L. Fleisher.
Report of Committee on Certified Heating, A. R. Thompson, chairman.
Discussion of Report.
Report of Field Representative, Edward G. Byrd.

12:30 P.M.

Ladies' Bridge Luncheon.

2:00 P.M.

Golf, Baseball, and Industrial Trips.

### June 13

9:00 A.M.

Report of Committee on Trade Relations, George Mehring, chairman.
Report of Nominating Committee.
The Secretaries' Conference, Its Purpose and Scope, William E. Taylor, executive secretary, Heating and Piping Contractors New York City Association.
Market Research Applied to the Heating Industry, E. L. Flentje, Market Research Division, Plumbing and Heating Industries Bureau.
Report of Convention Committees.
Election and Installation of Officers.

12:55 P.M.

Adjournment.

## Contractors Plan 100% Certified Heating in Wisconsin

By the first of August Wisconsin is expected to be the first state in the country in which every city having a population over 25,000 will have adopted certified heating.

Plans for the carrying out of this extensive program were made at the 19th annual convention of the Heating and Piping Contractors Wisconsin Association, held in Milwaukee April 16-17. In his report, A. F. Bowers, of Milwaukee, secretary and treasurer, stated that there were now 97 members in the association, 33 of whom have been taken into membership since the last convention.

Victor L. Peavy, state field representative, suggested in his report that the association hold a mid-summer convention. He also made the suggestion that the association employ a competent engineer who could speak on the subject of certified heating to conventions of other building trades associations. He stated that Janesville and Beloit are the only unorganized cities in the state at the present time, and that these cities are perfecting organization plans. When the associations in these cities affiliate with the state association the members of the latter will be doing 85% of the heating installation work in the state.

E. L. Flentje, of the Plumbing and Heating Industries Bureau, pointed out the importance of keeping mailing lists up to date and making certain that the prospects who are canvassed are financially responsible and able to afford new heating plants. He said that 60% of sales effort is wasted where literature is sent out indiscriminately; that 45% of the families in large cities have incomes less than $2200 per year. These names should be eliminated from lists, and he told the members that the bureau had lists containing names of the other 55% of the families for all cities over 100,000 in population.

There were 72 members registered at the convention as well as several nationally known speakers, including Joseph C. Fitts, acting secretary of the national association; E. G. Byrd, field representative of the national association; A. R. Herske, of the American Radiator Company. C. P. Finke, of Sheboygan, chairman of the nominating committee, was elected president for the coming year; F. D. Branson, of La Crosse, was elected vice-president. A. F. Bowers was re-elected secretary-treasurer. The number of directors was changed from five to seven and the following directors were elected for the coming year: Paul Downey, Charles Honold, G. F. Reeke, L. J. Erons, Jacob Zimmerman, T. L. Ahern, and J. J. Wiertz. Mr. Finke was elected as delegate to the national convention at St. Louis in June.

# Anniversary

*From* **Stewart A. Jellett**

*president, Stewart A. Jellett Co., Philadelphia, Pa.*

TWENTY-FIVE years—what memories it brings and what changes in the heating and ventilating profession have taken place in the last quarter of a century! Twenty-five years ago heating and ventilation was a business in which the "rule of thumb," guided by experience and horse sense, meant everything. Today it is an engineering profession developed on sound scientific lines possessing a library of research and carefully-edited data to guide the beginner, as well as those who lead in their profession.

The American Society of Heating and Ventilating Engineers initiated the movement, since continued, assisted most ably by THE HEATING AND VENTILATING MAGAZINE, which spreads abroad the scientific data and experience among heating and ventilating contractors and others not directly in touch with the work of the society itself.

For its work in this field, THE HEATING AND VENTILATING MAGAZINE deserves the greatest credit and the writer, as one who has followed closely the development and experience of the work done by the magazine, fully appreciates what Mr. Armagnac has accomplished. I hope for many more years of increasingly successful work by Mr. Armagnac and THE HEATING AND VENTILATING MAGAZINE.

*From* **C. Gottwald**

*president, The Ric-wiL Company*

YOUR announcement of the Silver Anniversary Number of THE HEATING AND VENTILATING MAGAZINE makes it pleasant to look back fifteen or twenty years to the days when you were working overtime to put a comparatively new magazine, in a comparatively new field, on its feet and headed toward success; and when we had our coats off and our sleeves rolled up over the job of making a young underground conduit company develop into a healthy and prosperous business organization.

Certainly the friendship which began in those days between us, and I include, of course, Mr. Petersen, has been a pleasant and valuable part of the busy years that have rolled around since. Both organizations have travelled a long way in those years, have grown in size, maturity, and success, and, for our part, we want you to know that we appreciate the fact that you and your publication have been a valuable help to us.

The whole Ric-wiL organization congratulates you on your Silver Anniversary and wishes you many happy and prosperous returns of the day.

*From* **Ralph T. Coe**

*The R. T. Cos., Rochester, N. Y.*

ACCEPT my congratulations on the Silver Anniversary of THE HEATING AND VENTILATING MAGAZINE, and upon the splendid service it has rendered the craft during all these years. I recall with interest Mr. Petersen's early scout trips when you were starting the publication. In those days it was hard to get men of experience in our field to loosen up on data so necessary for the rapid development of the art as we see it today.

In the interim, there has evolved in the business and professional world a spirit of "service before self" and you have kept plugging along "telling the world" all the latest news and developments in apparatus and application. More power to you!

July, 1928, was my 33rd anniversary "in the game."

*From* **George Mehring**

*Mehring & Hanson Co., Chicago, Ill.*

THE HEATING AND VENTILATING MAGAZINE is a real "Journal of Engineering Progress," has always had a place in our establishment accessible to all the workers therein, fulfilling its purpose in a very satisfactory manner for the last 25 years. We have turned to its pages when seeking the latest information on trade or technical matters.

The management is to be congratulated on its Silver Anniversary and on its achievement of an enviable reputation in all that concerns the interests of the heating and ventilating fraternity. The journal may be said to have a personality which its early readers hope will carry it on to greater success in the next 25 years.

*From* **Henry W. Wendt**

*president, Buffalo Forge Co., Buffalo, N. Y.*

I WANT to congratulate you and your organization on serving the heating and ventilating industry so satisfactorily for a quarter of a century. You, along with us, have seen the ventilating industry grow from a mere infant to the healthy boy stage. The ventilating business is expanding by leaps and bounds, and we expect that you will help us as much in the future to develop this industry as you have in the past.

*From* **E. K. Campbell**

*president, E. K. Campbell Heating Co., Kansas City, Mo.*

AT a time like this my memory goes back even beyond the 25-year life of your paper, to the work that was done, beginning in 1880, by my father, A. K. Campbell, then of Newton, Iowa, and later of Des Moines. The United States Patent Office granted him a patent on the moistening of air and the recirculation of air in connection with warm-air furnace heating. He was, according to their records, the first man in the world to do those two things in connection with furnaces. Later, according to my best information, he was the first man to build a steel furnace. Since recirculation is now the accepted method in connection with warm-air furnace heating and it was developed in the Mississippi Valley long before it reached the Atlantic Coast, it seems clear that the credit for the starting of that system should go to A. K. Campbell.

It seems fitting at a time like this, when as John Hale says, "We are thinking of way back when" that recognition of this service to the heating and ventilating industries and the furnace section of it particularly, should be rendered where it is due.

Your paper has always been ready to recognize and encourage progress and I congratulate you on the achievement of 25 years' progressive history.

# Greetings

*From* **F. R. Still**

*vice-president in charge of export, American Blower Corp., New York*

WHILE you are about to celebrate your Silver Anniversary, the time is not far distant when I may be celebrating my Golden Anniversary in that business which your magazine has done so much to foster and develop under your very able editorship.

As we look back over past events, we are all entitled to be proud of what we have individually accomplished in our efforts to improve the health, comfort, contentment and happiness of our fellow-beings. We were all pioneers, blazing a trail for others to follow, which has resulted in making this country an outstanding mark as a place "where life is worth living."

My congratulations are most cordially extended to you, and I hope you may live long to direct the policies of your paper in maintaining the leadership it has always commanded.

*From* **John F. Hale**

*Aerofin Corp., Newark, N. J.*

HOW well do I remember the first issue of THE HEATING AND VENTILATING MAGAZINE which came out two years after I had joined the A. S. H. & V. E. It was "like pulling teeth," wasn't it? And it took many years to get the public into sympathy with the new order of things.

Pioneering takes vision, but, above all, it requires considerable "intestinal fortitude." I was one of the pioneers in vacuum heating and have helped pioneer the modern, light-weight finned-tube fan-heating surface, and I know whereof I speak.

He who can pluck a new idea out of the sky and with indomitable patience meet and defeat the inevitable problems which all new things are heir to, is worthy of success.

Comparing the first issue of your magazine with the May number just out, one can easily imagine the grief which went between, and on this occasion of your twenty-fifth anniversary, allow me to congratulate you upon your present high standing among your contemporaries and in the minds of the heating and ventilating engineers.

*From* **J. C. Hornung**

*Central Heat Appliances, Chicago, Ill.*

TWENTY-FIVE years seems like a long time to be hammering away at one thing, but like "the little drops of water and the little grains of sand that make the mighty ocean and the pleasant land," THE HEATING AND VENTILATING MAGAZINE has been building mighty big; quite slowly for a number of years, to be sure, but of late years, Oh Boy! how A. & P. (not Atlantic and Pacific) have been making H. & V. hum.

Some of us "Old Timers" remember "Way Back When" THE HEATING AND VENTILATING MAGAZINE was a "wee thing," but there was an Idea behind it and a couple of boys with strong hearts and sincere ambitions to give us a medium for the exchange of more advanced thought in the great art of heating and ventilating.

I recall when one of the first issues came to my desk and never has a number missed since that time.

Congratulations and more power to Armagnac and Petersen.

*From* **A. W. Moulder**

*chief engineer, Grinnell Co., Providence, R. I.*

I WISH to congratulate THE HEATING AND VENTILATING MAGAZINE and yourself as editor, upon the occasion of your Silver Anniversary.

Having been connected with the heating industry during my entire business experience and having been a constant reader of your magazine during that entire period, I can scarcely imagine how I could have gotten along or even now could get along without this publication. I have relied upon this magazine more than any other to bring me the news of progress in the industry.

Please accept my best wishes for your continued growth and prosperity.

*From* **F. Paul Anderson**

*dean, College of Engineering, University of Kentucky*

A FORCEFUL, unprejudiced, progressive and responsive special technical journal is perhaps, the most valuable element in the evolution of any particular phase of engineering.

In my opinion THE HEATING AND VENTILATING MAGAZINE has done more for a longer period to advance the understanding and appreciation of the science of heating, ventilating and air conditioning than any other publicity agency consecrating itself to the fascinating and highly-important field of making man comfortable in his hours of either work or leisure.

Twenty-five years just passed have changed the chaotic, nebulous guessing about heating to almost an exact science. The B.T.U. is no longer a "mysterious stranger" but a lovable and understood companion.

I wish on this Silver Anniversary continued virility. Congratulations and best wishes.

*From* **A. H. Schroth**

*vice-president, Richmond Radiator Co., New York*

I EXTEND my best wishes to you on the 25th anniversary of your magazine.

Your ideals, established at the very conception of the magazine, have been carried out to the letter and, I am sure, are appreciated by all thoughtful readers.

The continued improvement in the publication has been marked in its editorial matter, its intelligent discussion of codes, research, legislation and trade practices.

In your advertising matter you have always endeavored to present only what is true—you have refused, as unfair and unethical, copy which singles out individual competitors, and have always insisted that statements of comparative efficiencies be accompanied by proof and complete supporting data, for all of which you are to be commended.

Your pages reflect the progress of the industry in a practical and helpful manner and in such language that both engineer and layman may read and understand.

You have been abreast of the times in relating the new developments as fast as they come on the market, notably in the development of unit heaters and oil burners.

I heartily wish you continued success.

*From* **J. Irvine Lyle**

*treasurer and general manager of the Carrier Engineering Corp., Newark, N. J.*

IT is with a most friendly feeling that I take this opportunity to extend my good wishes to THE HEATING AND VENTILATING MAGAZINE on its 25th Anniversary. It is interesting to note that the quarter-century during which this magazine has been a helpful mentor to those engaged in the science of heating and ventilating marks almost exactly the period through which the modern science of air conditioning has grown from the crudest forms of steam heating and mechanical ventilation to the place which it assumes today in American industry.

Within an ever-increasing number of industries air conditioning is becoming the useful and frequently an indispensable servant of the progressive manufacturer, freeing him from daily weather uncertainties and improving the quality of his product, contributing to the health, efficiency and happiness of his employees.

Heating, ventilating and air conditioning have paralleled and kept in the front ranks in the development and the improvement of equipment which has marked the astounding advance in methods of building construction, sanitation, lighting and manufacturing methods.

Heating and ventilating engineering has assumed the dignity of a profession. Those investing in buildings and industry are finding it increasingly profitable to refer their problems to capable engineers who have made this science their specialty. The responsibility rests upon the engineering societies and upon the journals devoted to heating and ventilating to maintain and enhance this dignity through encouragement of engineering research, through the insistence upon improved business ethics and through discrimination in the recognition of engineering ability.

*From* **John W. Meyer**

*manager, Steam Heat Sales Division, The Philadelphia Electric Co. and president, National District Heating Association*

GREETINGS, and my hearty congratulations upon this, your Silver Anniversay.

During the past twenty-five years, you have had the rare privilege of observing, at close range, the amazing development of the heating and ventilating industry, to which you have so signally contributed.

It must be very gratifying to you to look back over those years and to realize that the present status of the art confirms your early conception of what it might be. I venture to predict that the growth during the next decade will far surpass the developments of the past twenty-five years, and that THE HEATING AND VENTILATING MAGAZINE will, in the future, as it has so ably done in the past, render increasingly valuable service in behalf of humanity.

May you personally and your splendid staff continue to enjoy good health that you may all reap some of the benefits from your past and present endeavor to make homes and buildings devoted to religion, education, recreation and business, better places in which to live.

*From* **Walter Klie**

*president, Heating and Piping Contractors National Association*

IT affords me great pleasure to extend to you at this time my own personal best wishes and greetings, as well as those of the Heating and Piping Contractors National Association, on this your Silver Anniversary number of your splendid magazine.

Your journal has been a real factor in the growth of the heating and ventilating industry, and your intelligent cooperation in all matters pertaining to its improvement are greatly appreciated by our association.

Best wishes for your continued success.

*From* **Prof. A. C. Willard**

*professor of heating and ventilation and head of Department of Mechanical Engineering, University of Illinois*

TWENTY-FIVE years of splendid progress and achievement is a notable record for any human enterprise and you and your associates on the staff of THE HEATING AND VENTILATING MAGAZINE are to be sincerely complimented and heartily congratulated on your accomplishments during the past quarter of a century. You have the distinction of being "a pioneer, a trail blazer" in the heating and ventilation field.

As the reviewer and critic, as the recorder and analyzer of technical and industrial data, you have been discriminating, sympathetic, and at the same time fearless in pointing out what you felt was good or bad for the profession and the industry. May you continue in the future as in the past as the leader in the "Heating and Ventilating" field.

*From* **Thornton Lewis**

*president, American Society of Heating and Ventilating Engineers*

IT gives me a great deal of pleasure on behalf of the American Society of Heating and Ventilating Engineers to congratulate THE HEATING AND VENTILATING MAGAZINE on the occasion of your Silver Anniversary.

You have been a great factor in the development of the industry in which our society is so interested. You have been sympathetic to the problems of the society and have always been ready to advance high ideals in this profession.

May you continue as a useful and prosperous enterprise and reach your Golden Jubilee.

*From* **Webster Tallmadge**

*president, Webster Tallmadge & Co., New York*

TWENTY-FIVE years ago, heating systems largely consisted of cumbersome cast-iron direct and indirect radiators or pipe coils. The systems, in general, were poorly designed as to piping sizes, air-duct arrangements and capacity, and the technique of the performance of the systems was little understood.

Present-day heating systems from yearly records show better comfort with half the fuel. This accomplishment has only been possible as the result of free exchange of thought through the technical press and national engineering societies.

The work of THE HEATING AND VENTILATING MAGAZINE stands alone in its field. Deep beneath and through the heating profession is impregnated the effects of your effort and from which your work admirably is reflected.

The world cannot help but commend and appreciate the success of your organization.

*From* **Samuel R. Lewis**

*consulting engineer, Chicago, Ill.*

I SEND you greetings from out in the middle of the Caribbean Sea. The air is balmy and the sea is smooth and the sun is bright. I wish that your magazine and your life may be equally auspicious, with only enough head winds to keep you vigorous.

*From* **William G. Braemer**

*chief engineer, Universal Humidifier Corp., Philadelphia, Pa.*

THOSE who like myself have been identified with the heating, ventilating and air-conditioning industry since the early '90's cannot but marvel at the wonderful development and progress which has taken place in all of the branches in this field.

I have been an interested reader of your magazine from its start, and I feel THE HEATING AND VENTILATING MAGAZINE and yourself as editor are entitled to a large credit for the part taken in the evolution of the industry.

It may interest you to know that I have a practically complete file of your magazine from the start, and I am always looking forward towards receiving each issue, since it contains matters really worth while to the industry.

On the occasion of the Silver Anniversary of THE HEATING AND VENTILATING MAGAZINE I wish to extend my congratulations and my best wishes for your continued success.

*From* **L. A. Harding**

*president of L. A. Harding Construction Corp., Buffalo, N. Y. and chairman of the A. S. H. & V. E. Committee on Research*

THE writer wishes to congratulate THE HEATING AND VENTILATING MAGAZINE, and its editor, on the completion of a quarter of a century of service to the heating and ventilating fraternity. Your magazine has always kept pace with this rapidly-changing art, which is becoming to be a recognized science. May you continue to grow and prosper.

*From* **Prof. C. H. B. Hotchkiss**

*associate professor of heating and ventilating, Purdue University*

THOSE of us whose memories do not carry back to the actual beginnings of THE HEATING AND VENTILATING MAGAZINE are none the less aware of the value of its work in the more recent years. We who represent a younger generation are definitely looking forward to the next twenty-five years.

If the magazine continues to lead in that period as it has in the recent past we may look to it to herald, and to report, those advances which seem just around the corner.

May THE HEATING AND VENTILATING MAGAZINE continue to grow and thrive even as we are confidently expecting the arts of heating and of ventilating to develop.

*From* **J. C. Johnson**

*president, S. T. Johnson Co., Oakland, Cal.*

I WANT to compliment you on not only the appearance, but the contents of THE HEATING AND VENTILATING MAGAZINE for May and for a number of the late issues. It does appear that THE HEATING AND VENTILATING MAGAZINE has grown old gracefully and I sincerely wish you continued prosperity and good health. It is a magazine certainly enjoyed in the industry.

*From* **Alfred J. Offner**

*Offner & McKnight, consulting engineers, New York*

A QUARTER of a century of faithful and constructive services in one's chosen field of endeavor, including leadership, is a record to be envious of. May the years to come bring to THE HEATING AND VENTILATING MAGAZINE still further opportunities, and to you, Mr. Armagnac, health and happiness.

*From* **George M. Getschow**

*president, Phillips, Getschow Co., Chicago, and chairman, Boiler Output Committee, Heating and Piping Contractors National Association*

IT is a pleasure to say a few words on this your Silver Anniversary. Many readers of THE HEATING AND VENTILATING MAGAZINE are interested in heating boiler selection. As chairman of the Boiler Output Committee of the Heating and Piping Contractors National Association, I am pleased to say that, after five years of work by the committee, we have in the hands of our members recommended net radiation loads for boiler selection. I feel this will be of material assistance to our members in standardizing their heating installations.

You are to be congratulated for the good work done in advancing standardization.

*From* **Ralph Collamore**

*Smith, Hinchman & Grylls, Detroit, Mich.*

IT is distinctly a pleasure for me to extend felicitations to you on this the 25th anniversary of THE HEATING AND VENTILATING MAGAZINE.

I have seen many changes in the science of heating and ventilating this last twenty-five years and, happily, have been associated with many activities which endeavored to contribute in some measure to its further advancement.

I do not know, however, of any one feature which has been more constantly before the profession, growing with it, for it, and now become a part of it, than THE HEATING AND VENTILATING MAGAZINE.

May its next twenty-five years be as prolific of service as its first twenty-five.

*From* **James McAlear**

*president, McAlear Mfg. Co., Chicago, Ill.*

UNTIL my attention was called to it, I had no idea that your magazine was twenty-five years old. I remember well when it first appeared, and when I look back I feel that you are eligible as "Old Timers" yourselves. I believe if you were to write about the developments in the matter of building your own magazine it would make very interesting reading. You certainly have done a great deal for the profession and trade in the way of keeping them posted on new developments and directing their endeavors along lines that worked out to their advantage.

I want to congratulate you on the wonderful success you have made of your magazine which is creditable only to the high standard you have maintained and the high percentage of results accruing to advertisers.

I wish you and your organization every success.

*From*

**Frederick W. Herendeen**

*secretary, National Boiler and Radiator Manufacturers' Association*

PERMIT me to congratulate you as editor of the excellent magazine that you publish, namely, THE HEATING AND VENTILATING MAGAZINE, in arriving at the good age of 25.

Your magazine has contributed a great deal to the industry and it steadily improves and grows better.

*From* **Samuel A. Challman**

*state director of school buildings, Department of Education, of Minnesota*

My first contact with THE HEATING AND VENTILATING MAGAZINE dates back almost twenty years. It has been my *vade mecum* ever since. Its growth in size, its discussion of current problems, and its recognition of the principles and practices that make for progress have exerted a wonderful influence upon the profession. It has been a valuable clearing house for engineering thought and it has kept pace with the ever-widening field of service which the engineer is called upon to master and the intricate problems which he is called upon to solve.

To say that it has fulfilled and continues to fulfill its mission in a highly satisfactory manner and has achieved lasting honor and distinction is merely a just recognition of its undisputed leadership in the engineering field. My best wishes go with you as you enter upon the second quarter of the century race of progress.

*From* **G. W. Stanton**

*president, Almirall & Co., New York*

HEATING engineers of the present day little realize the lack of real scientific data available twenty-five years ago. There were no research laboratories from which to obtain authentic data, and such data as we had were mostly from foreign sources. The prevalent method of designing heating and ventilating apparatus was by crude formulas or rule-of-thumb.

TO THE HEATING AND VENTILATING MAGAZINE credit must be given for disseminating the knowledge and experience of the foremost engineers of that time and since, and educating the practical men engaged in the business, thus improving both design and installation.

Congratulations, therefore, are due to THE HEATING AND VENTILATING MAGAZINE for its services to the profession. May it continue to grow in the future as in the past.

*From* **Albert L. Baum**

*Jaros & Baum, Consulting Engineers, New York*

CONGRATULATIONS upon your Silver Anniversary.

We have been subscribers of your paper for upwards of a dozen years. During that time, we have not only enjoyed reading the paper for the material which it contained, but have also learned through its pages of the experience of other people with problems very similar to those which we encounter daily.

At the risk of appearing to be a bromide, I must reiterate the oft-repeated fact that the most useful and able engineering is done by men provided with a wealth of background and experience, and I feel that your paper has done much in the heating and ventilating field in bringing the experience of the comparative few to the attention of the many.

Best wishes for your continued success.

*From* **Clyde R. Place**

*consulting engineer, New York*

IN 1905 it was necessary for me to get quickly and accurately some information about a certain new heating product then being put on the market. I asked Mr. Armagnac if he was acquainted with this product. His answer at that time was "No," BUT——, and here is the point,—— he said "I'll find out."

He did, gave me all the information needed and then got the company to advertise in THE HEATING AND VENTILATING MAGAZINE. Their advertisement is still there.

I give the above experience of over twenty years ago, for the purpose of showing why Mr. Armagnac and THE HEATING AND VENTILATING MAGAZINE have been so successful.

The simple answer being, "he has always been on the job."

*From* **Dr. E. Vernon Hill**

*editor of The Aerologist, Chicago, Ill.*

I NOTE with pleasure the announcement of your Silver Anniversary Number, marking a quarter century of successful journalistic leadership in the field of heating and ventilation.

I first became interested in THE HEATING AND VENTILATING MAGAZINE seventeen years ago, when it was not so large as it is today. It was much smaller at that time, about the size of the erstwhile *Journal* of the A.S.H. & V.E., perhaps a little larger. But even then it was big enough to carry forward the banner of the profession and the industry, and to carry it alone.

I congratulate you and your associates on the success of a worthy enterprise and I sincerely hope that I may have occasion to again felicitate you on your Golden Jubilee.

*From* **Nelson S. Thompson**

*chief engineer, Office of Supervising Architect, Treasury Department, Washington, D. C.*

I CONGRATULATE you and Mr. Petersen and your associates who during the last twenty-five years have struggled with the task of producing a publication appealing to a limited field of highly-technical men, the engineers in the field being underpaid and the contractors buying with their limited personal funds a lot of trouble—generally called a contract.

I am glad that you have seen fit during the twenty-five years to accept and publish practically all that I have written along engineering lines. I trust that it has helped some of your subscribers.

May your next twenty-five years be pleasant and profitable. Be assured of a warm place in my heart for your magazine.

**THE EVOLUTION**

*From* **Conway Kiewitz**

*engineer, New York City Board of Education*

T-he evolution of
H-eating and ventilating
E-ndeavors started, after stoves, with

H-ot-air furnaces, then
E-ntered fans for efficiency,
A-nd water pans for humidity;
T-hen low-pressure one-pipe steam jobs
I-nstead;
N-ewer two pipe steam and hot-water systems
G-iving better effect,

&-with good attention never considered supreme;

V-entilation now introduced,
E-nvy of all old masters
N-ewer fads, to produce,
T-hen the vapor,
I-ncluding the vacuum,
L-imitless, with air conditioning
A-nd other new fandangles, all
T-ogether
I-nstalled as one,
N-ow insure: sane
G-ood, workable, dependable,

M-asterfully efficient installations
A-dequate for all fuels,
G-as and electricity included;
A-dded by
Z-eal and enthusiasm, helped and made
I-nstrumental: by this
N-ewsy magazine
E-nterprise.

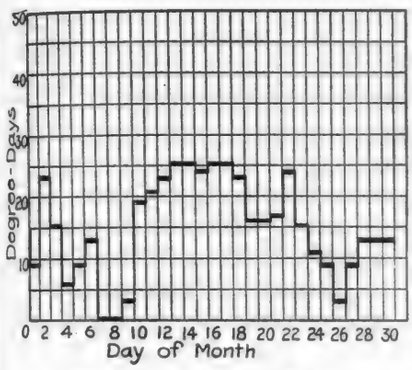
# Monthly Heating Load in Degree-Days in Nine Typical Cities

DEGREE-DAY charts for representative cities in the United States are presented for use by heating contractors, house-heating managers of gas companies, heating appliance salesmen, and others interested in fuel consumption. At the end of the season these graphs can be pasted together and the heating load will be represented by a continuous line for the season.

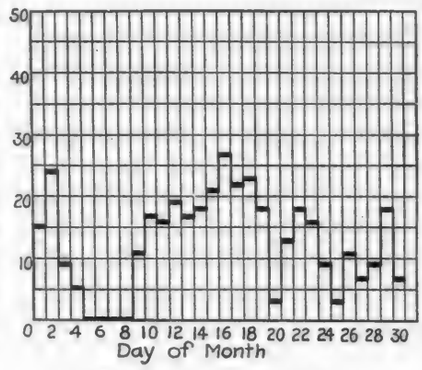
The degree-day is a unit coined by the American Gas Association and is the product of 1° in temperature and 1 day. When the average daily temperature falls below 65° the heating load is proportional to the difference between the daily temperature and 65°, and the number obtained represents the number of degree-days for that day.

When the average daily temperature is 54°, for example, the number of degree-days for that day is (65-54) or 11. When the average temperature is 40°, the degree-days total 25.

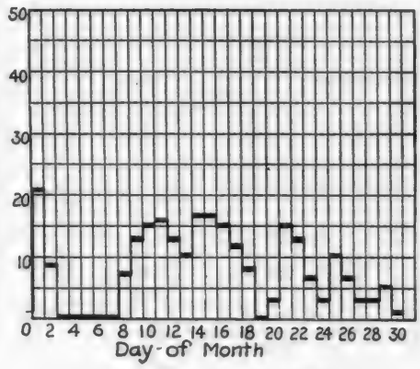
The total number of degree-days for a given month when divided by the yearly total will give the percentage of heat demand for that particular month. Unit fuel consumption figures, in quantities of fuel per degree-day per square foot of radiation or per square inch of leader pipe, are available for different fuels, different types of heating systems and for various grades of fuels, so that fuel consumption problems can readily be solved by applying degree-day data.



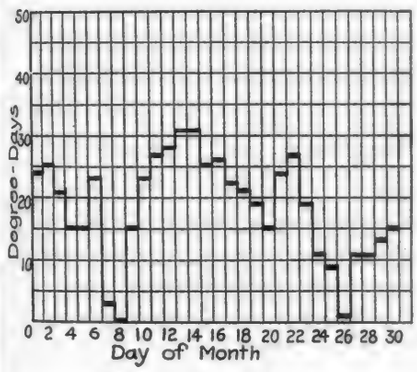

**New York, April, 1929**
Degree-Days 447—Degree-Days to Date 4699



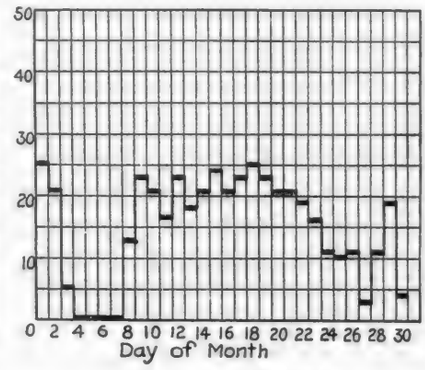

**Pittsburgh, April, 1929**
Degree-Days 376—Degree-Days to Date 5128



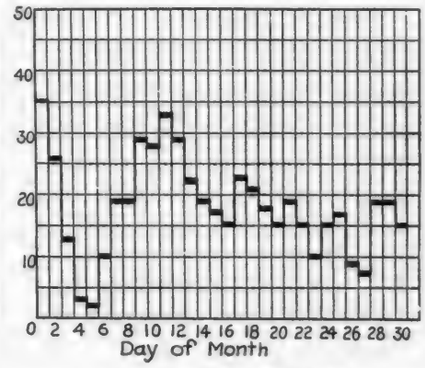

**St. Louis, April, 1929**
Degree-Days 242—Degree-Days to Date 4487



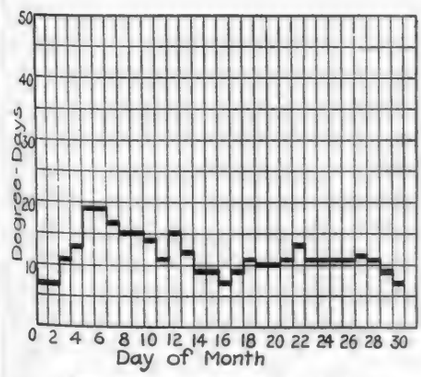

**Boston, April, 1929**
Degree-Days 550—Degree-Days to Date 5178



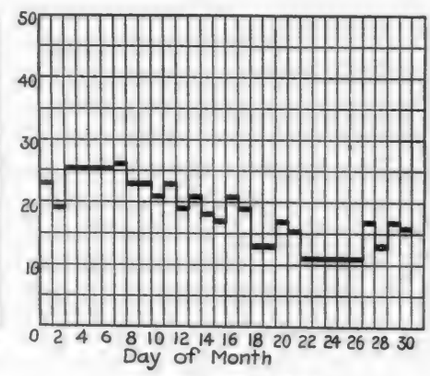

**Chicago, April, 1929**
Degree-Days 449—Degree-Days to Date 5995



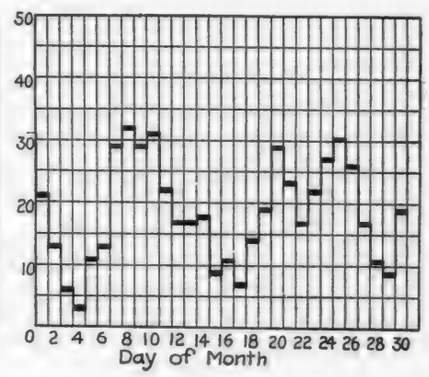

**Minneapolis, April, 1929**
Degree-Days 541—Degree-Days to Date 7710




**San Francisco, April, 1929**
Degree-Days 347—Degree-Days to Date 2671



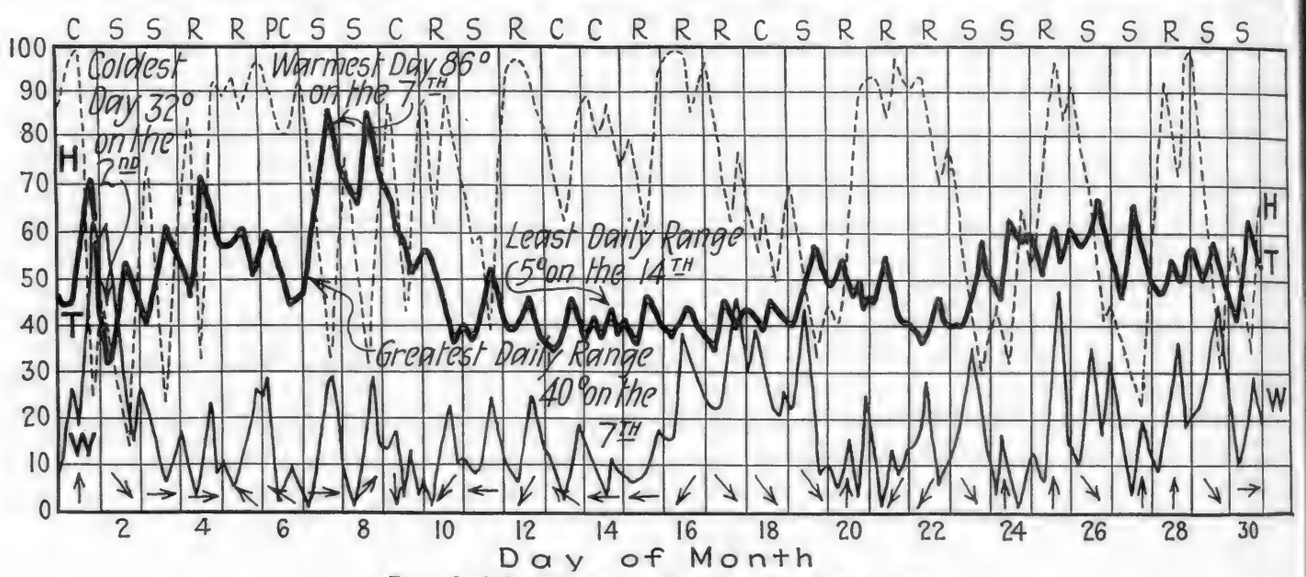

**Seattle, April, 1929**
Degree-Days 549—Degree-Days to Date 4797



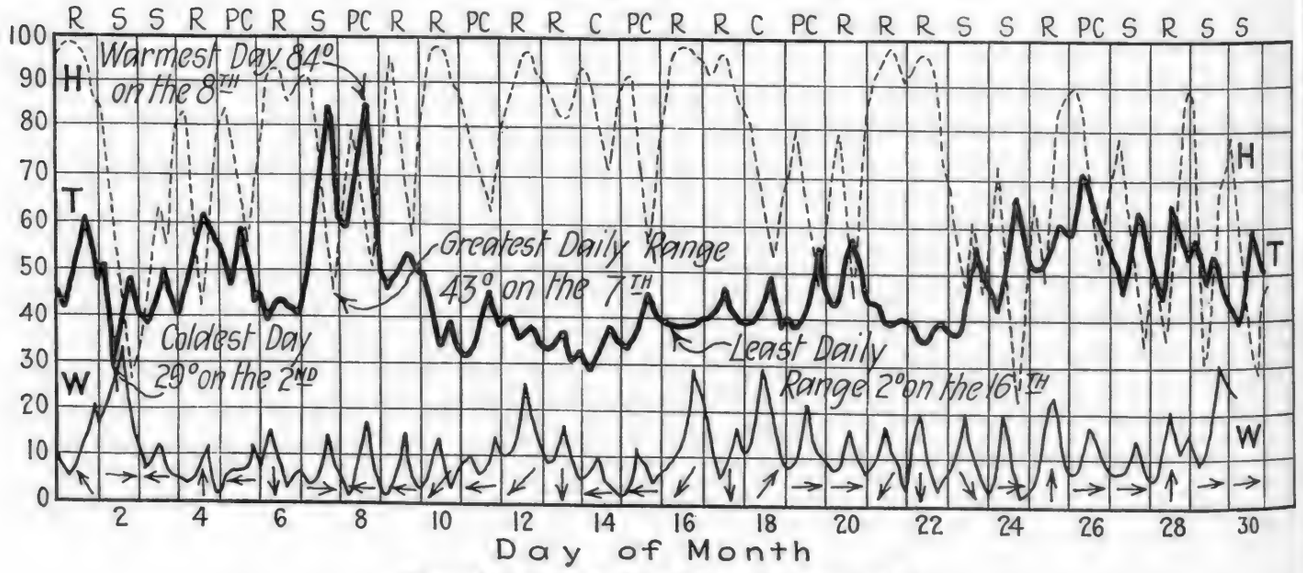

**Denver, April, 1929**
Degree-Days 552—Degree-Days to Date 6012

# The Weather for April, 1929

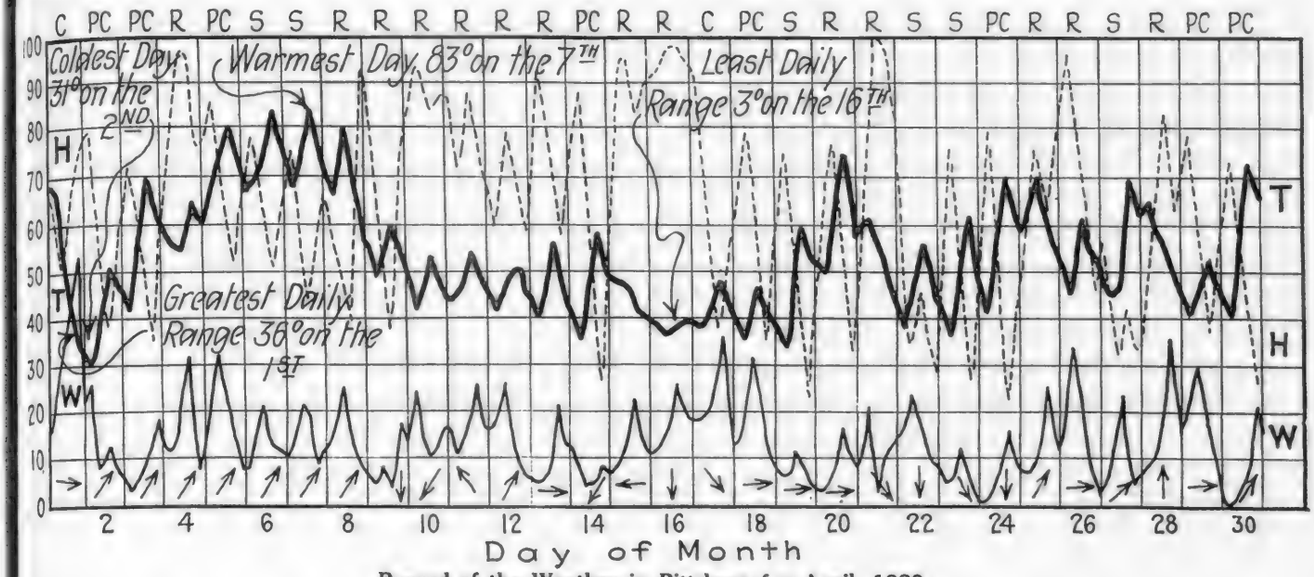
| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, degrees F. | 86 | 84 | 83 | 84 | 87 |
| Date of highest temperature | 7 | 8 | 7 | 6 | 4 |
| Lowest temperature, degrees F. | 32 | 29 | 31 | 31 | 36 |
| Date of lowest temperature | 2 | 2 | 2 | 1 | 1 |
| Greatest daily range, degrees F. | 40 | 43 | 36 | 31 | 30 |
| Date of greatest daily range | 7 | 7 | 1 | 3 | 2 |
| Least daily range, degrees F. | 5 | 2 | 3 | 4 | 4 |
| Date of least daily range | 14 | 16 | 16 | 15 | 21 |
| Mean temperature for month, degrees F. | 50.6 | 47.1 | 53.4 | 51.1 | 58.2 |
| Normal mean temp. for month, degrees F. | 49.4 | 46.4 | 51.2 | 46.9 | 56.1 |
| Total precipitation, this month, inches | 5.76 | 7.52 | 4.29 | 4.79 | 6.99 |
| Total snowfall, this month, inches | Trace | 0.6 | Trace | Trace | 0 |
| Normal precipitation, this month, inches | 3.17 | 3.34 | 2.92 | 2.78 | 3.81 |
| Total wind movement, this month, miles | 11,825 | 7,199 | 8,565 | 8,367 | 10,012 |
| Average hourly wind velocity, miles | 16.4 | 10.0 | 11.9 | 11.6 | 13.9 |
| Prevailing direction of wind | N.W. | W. | S.W. | N.E. | S.W. |
| Number of clear days | 5 | 6 | 4 | 9 | 10 |
| Number of partly cloudy days | 8 | 7 | 12 | 6 | 10 |
| Number of cloudy days | 17 | 17 | 14 | 15 | 10 |
| Number of days with precipitation | 15 | 16 | 16 | 14 | 15 |
| Number of days with snowfall | 1 | 2 | 1 | 1 | 0 |
| Snow on ground at end of month | None | None | None | None | None |


C S S R R PC S S C R S R C C R R R C S R R R S S R S S R S S
Coldest Day 32° on the 2nd
Warmest Day 86° on the 7th
Least Daily Range 5° on the 14th
Greatest Daily Range 40° on the 7th
H
T
W
Day of Month

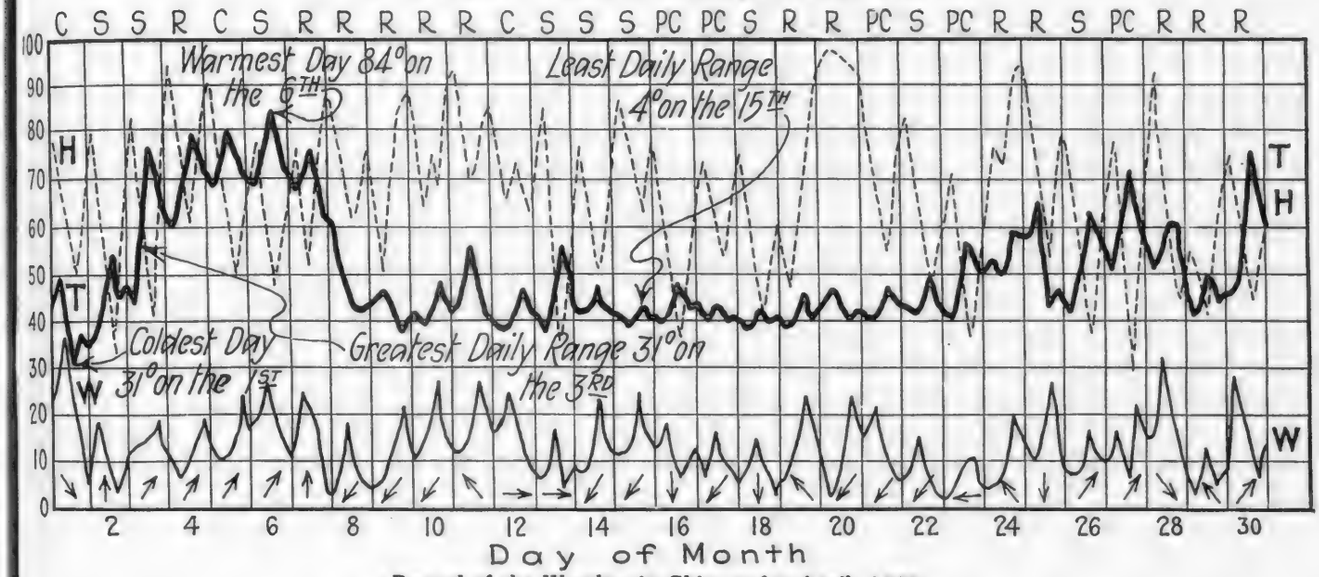
**Record of the Weather in New York for April, 1929**
(Hourly Observations of the Relative Humidity Plotted on this Chart)


R S S R PC R S PC R R PC R R C PC R R C PC R R R S S R PC S R S S
Warmest Day 84° on the 8th
Greatest Daily Range 43° on the 7th
Coldest Day 29° on the 2nd
Least Daily Range 2° on the 16th
H
T
W
Day of Month

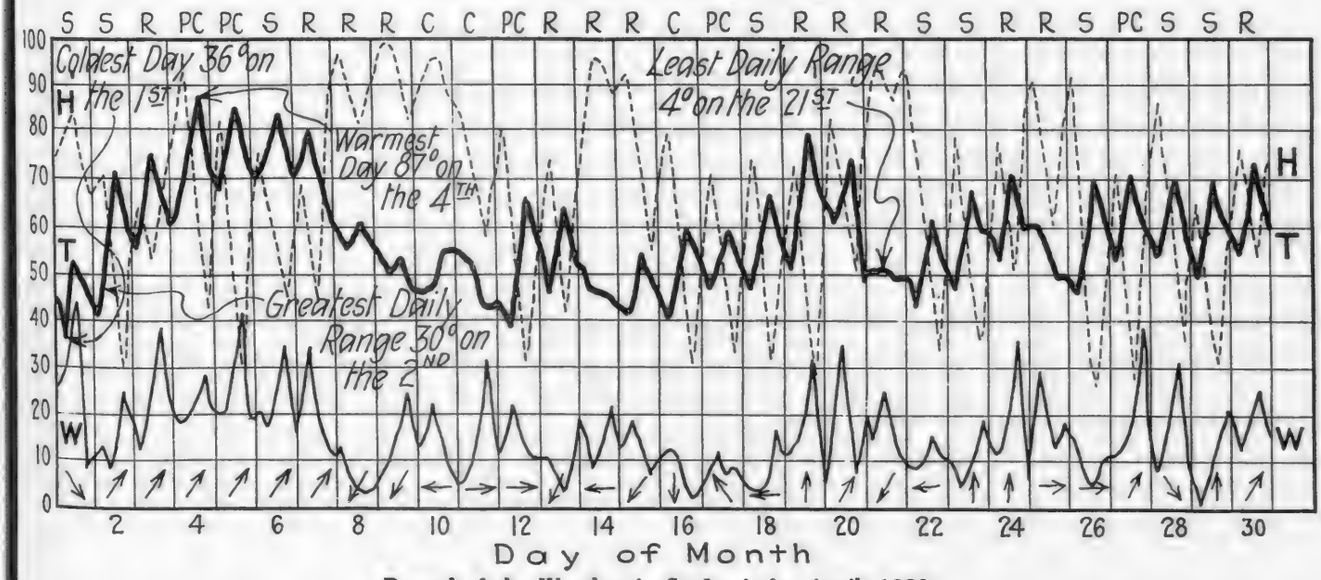
**Record of the Weather in Boston for April, 1929**


C PC PC R PC S S R R R R R R PC R R C PC S R R S S PC R R S R PC PC
Coldest Day 31° on the 2ND
Warmest Day 83° on the 7TH
Least Daily Range 3° on the 16TH
Greatest Daily Range 36° on the 1ST
H
T
W
Day of Month

**Record of the Weather in Pittsburg for April, 1929**


C S S R C S R R R R C S S S PC PC S R R PC S PC R R S PC R R R
Warmest Day 84° on the 6TH
Least Daily Range 4° on the 15TH
Coldest Day 31° on the 1ST
Greatest Daily Range 31° on the 3RD
H
T
W
Day of Month

**Record of the Weather in Chicago for April, 1929**


S S R PC PC S R R R C C PC R R R C PC S R R R S S R R S PC S S R
Coldest Day 36° on the 1ST
Least Daily Range 4° on the 21ST
Warmest Day 87° on the 4TH
Greatest Daily Range 30° on the 2ND
H
T
W
Day of Month

**Record of the Weather in St. Louis for April, 1929**

Plotted from records especially compiled for HEATING AND VENTILATING by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M. Arrows fly with prevailing directions of wind.
C—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.

Joseph C. Fitts

Russell G. Creviston

R. M. Conner

E. B. Langenberg

# Association for Correlating Thermal Research Gets Under Way

A CROSS-INDEXED card catalog of books, periodicals, magazines, articles and pamphlets on the subject of thermal engineering now is available to the engineering public through the Association for Correlating Thermal Research, with headquarters at the Research Laboratory of the American Society of Heating and Ventilating Engineers at Pittsburgh.

More than 10,000 cards for 3500 pieces of literature have been prepared, making this the most complete index available of literature in this branch of engineering. At the present time it is not the plan of the directors to build up a library of printed material, but rather an index of the available data together with information concerning where it may be found.

A file is being developed containing critical abstracts of the more important articles so that the person searching for information need not look up the many articles dealing with the particular subject in order to find out which ones contain information desired.

The undertaking is the result of a meeting at White Sulphur Springs, in June, 1927, when 75 persons representing 25 organizations responded to a request by S. R. Lewis, chairman of the committee on research of the society, that a meeting be held.

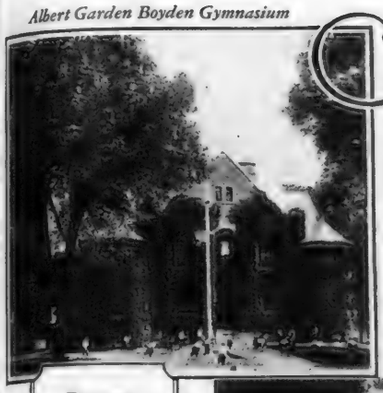
At this time it was agreed that a permanent organization should be effected for the purpose of encouraging cooperation in research in thermal engineering, with special reference to heating and ventilation, so as to make available the vast amount of published data on this subject. A committee of three was appointed to investigate the possibility of adopting such an organization, and the committee was instructed to report to the annual meeting of the society in New York in January, 1928.

A survey by the committee was then made of the many organizations and laboratories carrying on or supporting research in thermal engineering in an effort to find out to what extent such laboratories and organizations would support an effort to bring about the desired cooperation.

As a result of this survey a directory of names was prepared of 38 laboratories, societies, and associations, which are either carrying on, supporting or encouraging research

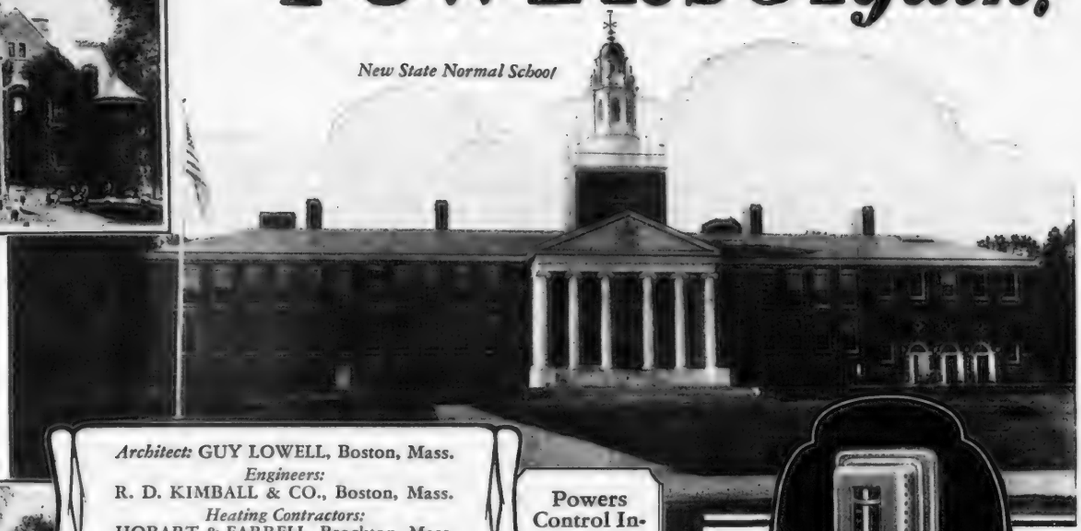
Mattie L. Houghten, Technical Librarian, and Card Files of the Association for Correlating Thermal Research

*Albert Garden Boyden Gymnasium*



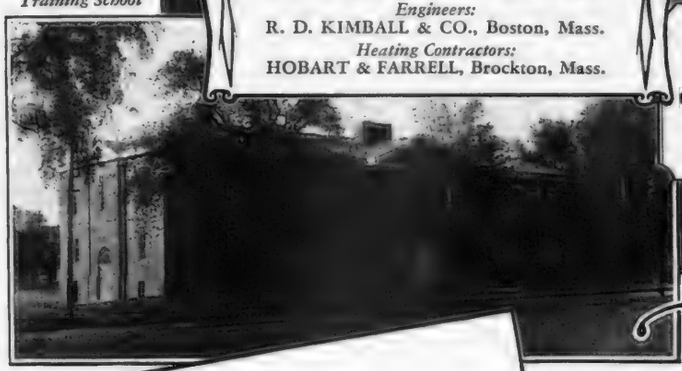
# *After* 22 Years . . POWERS *Again!*

*New State Normal School*



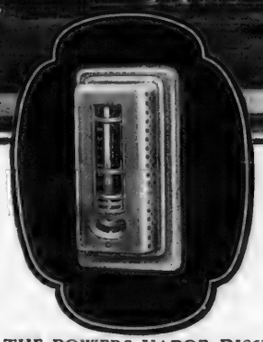
Powers Control Installed Here in 1904

*New Training School*

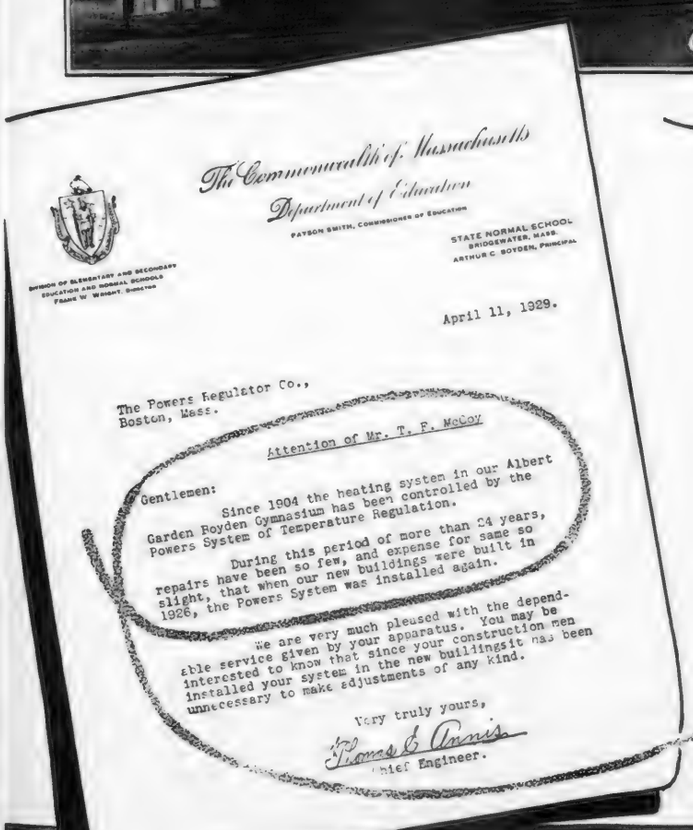


*Architect:* GUY LOWELL, Boston, Mass.
*Engineers:*
R. D. KIMBALL & CO., Boston, Mass.
*Heating Contractors:*
HOBART & FARRELL, Brockton, Mass.

Powers Control Installed in these buildings in 1926



THE POWERS VAPOR DISC THERMOSTAT
Does not need to be adjusted or overhauled annually



The Commonwealth of Massachusetts
Department of Education
PAYSON SMITH, COMMISSIONER OF EDUCATION
STATE NORMAL SCHOOL
BRIDGEWATER, MASS.
ARTHUR C. BOYDEN, PRINCIPAL
DIVISION OF ELEMENTARY AND SECONDARY EDUCATION AND NORMAL SCHOOLS
FRANK W. WRIGHT, DIRECTOR

April 11, 1929.

The Powers Regulator Co.,
Boston, Mass.

Attention of Mr. T. F. McCoy

Gentlemen:

Since 1904 the heating system in our Albert Garden Boyden Gymnasium has been controlled by the Powers System of Temperature Regulation.

During this period of more than 24 years, repairs have been so few, and expense for same so slight, that when our new buildings were built in 1926, the Powers System was installed again.

We are very much pleased with the dependable service given by your apparatus. You may be interested to know that since your construction men installed your system in the new buildingsit has been unnecessary to make adjustments of any kind.

Very truly yours,
Thomas E. Annis
Chief Engineer.

# *Because*

THE big dividends to be gained on an investment in Automatic Heat Regulation are greatly reduced if the thermostats, after a few years of good service, get out of adjustment and need to be overhauled every year.

Thermostats out of adjustment result in over-heated rooms, cause discomfort to the occupants and waste a considerable amount of fuel.

To get the maximum return on an investment in Heat Regulation, install POWERS control and *get 15 to 20 years of Accurate regulation* without the frequent repairs and "Service" bills that come with lower first cost systems of control.

Powers first cost is usually higher. But the bigger dividends it earns makes it cost much less in the end.

THE POWERS REGULATOR COMPANY
*35 Years of Specialization in Temperature Control*
CHICAGO
2720 Greenview Avenue
NEW YORK CITY
137 East 46th Street
*Offices in 35 Other Cities*
The Canadian Powers Regulator Company, Ltd., Toronto, Ont.

# POWERS

in this field. The directory was distributed and the committee reported its findings to a meeting held in New York, January, 1928, with 200 persons attending. The committee was enlarged to include representatives of other organizations, and was instructed to organize an association for carrying on the work of correlating research.

The committee held three meetings, one in Chicago, New York and Pittsburgh, during the year. Constitution and bylaws were adopted and the organization was incorporated under the laws of Pennsylvania as the Association for Correlating Thermal Research. The committee acted as the first board of directors. June 1, 1928, the board of directors of the association employed Mattie Lincoln Houghten, wife of F. C. Houghten, director of the society's Research Laboratory, as technical librarian. Since that time she has been engaged in cataloging literature and information on thermal research at the laboratory. Three complete card catalogs are being developed for the purpose of collecting for the engineering profession and industry, information concerning existing data and research.

All of these files are available to the engineering profession and industry, and the technical librarian will be glad to cooperate with those seeking information. Information may be obtained by addressing Mattie Lincoln Houghten, at the Research Laboratory, 4800 Forbes St., Pittsburgh, Pa.

# Program for A. S. H. & V. E. Summer Meeting

AN interesting and important technical program has been arranged for the semi-annual meeting of the A.S.H. & V.E. to be held at Bigwin Inn, Lake of Bays, Ontario, Can., June 26-28.

The committee on arrangements, consisting of M. Barry Watson, chairman, E. B. Sheffield, Melvern F. Thomas, Arthur S. Leitch, Arthur J. Dickey, and Edward M. Dolan, all of the Ontario Chapter, has planned a worth-while entertainment program, and has collected complete information on matters of transportation for members who will attend. It is possible to reach Bigwin Inn by motor, rail or plane. It is proposed to run a special train from Toronto to Lake of Bays, Tuesday, June 25, arriving in time for dinner in the evening, and it is suggested that each chapter arrange for a special car to run via Toronto where it will be attached to the Bigwin Inn special.

Bigwin Inn is reached by both the Grand Trunk and Canadian National Railways via Toronto and Huntsville, from which there is a connecting boat service to the inn. Round trip tickets should be purchased, as special excursion rates will be in effect in June.

Detailed road direction can be supplied by the committee to those who will motor to the convention. Motorists reaching Toronto are asked to register at the society's booth there, and it is hoped that it will be possible to arrange groups of cars to be sent to Bigwin Inn under the direction of special traffic officers.

At the hotel, arrangements have been made for service on the American plan at the rate of $7.50 per person per day. The privilege of using the golf course is included in this rate, excepting for the society tournament. Individuals will pay their own caddy fees, as well as garage and boat hire.

Plans for the meeting include technical sessions daily from 9:30 A.M. to 1:00 P.M., with the remainder of the time available for amusement and sports.

The complete program is given below:

### June 26

Registration.
Greeting by president of Ontario Chapter, E. B. Sheffield.
Response, President Thornton Lewis.
Instruments for the Measurement of Air Velocity, Prof. J. H. Parkin.
Analysis of the Overall Efficiency of a Residence Heated by Warm Air, Prof. A. P. Kratz and J. F. Quereau.
Air Conditioning System of a Detroit Office Building, H. L. Walton and L. L. Smith.
Report of Committee on Code for Testing and Rating Unit Heaters, D. E. French, chairman.

### June 27

Report of Committee on Interpretation of Code for Rating Low-Pressure Heating Boilers, L. A. Harding, chairman.
Determining Dust Quantities in Air, Prof. F. B. Rowley.
Capacity of Radiator Supply Branches for One and Two-Pipe Systems, F. C. Houghten, M. E. O'Connell and Carl Gutbertlet.
Pipe Sizes for Hot Water Heating Systems, Prof. F. E. Giesecke and E. G. Smith.
Report of Guide Publication Committee, S. R. Lewis, chairman.

### June 28

Report of Committee on Code for Heating and Ventilating Garages, E. K. Campbell, chairman.
Time Lag as a Factor in Heating Engineering Practice, James Govan.
Overall Heat Transmission Coefficients Obtained by Tests and Calculations, Prof. F. B. Rowley, A. B. Algren, and J. L. Blackshaw.
Five Suggested Methods of Appraising Insulations, Paul D. Close.
Report of Advisory Committee on Heating and Ventilating Exposition, H. P. Gant, chairman.

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## Headquarters Selected for 1930 Meeting

Hotel headquarters for the thirty-fifth annual meeting of the American Society of Heating and Ventilating Engineers will be at the Benjamin Franklin Hotel, 9th and Chestnut Sts., Philadelphia, Pa., January 27-30, 1930.

President A. C. Edgar, of the Philadelphia Chapter, recently announced that the general chairman of the committee on arrangements would be R. C. Bolsinger. Technical sessions will be so arranged that the visiting members and guests will have ample opportunity to attend the First International Exposition of Heating and Ventilating, which will be held at the Commercial Museum during the same week as the society's meeting.

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## Newspapers Support Home-Modernizing

The interest in home modernizing and the cooperation it is receiving from various organizations and groups are reflected in the news that in Hartford, Conn., the *Hartford Times* is operating a home modernizing bureau and publishing 16 pages each Saturday on this subject. In Milwaukee, the *Wisconsin News* is publishing 5 pages. In St. Paul, the *Pioneer Press* started a campaign in that city with 16 pages devoted to modernizing. In Oklahoma, the Oklahoma State League of Building and Loan Associations started a home modernizing campaign, inaugurated April 9, with an extensive program of publicity and advertising.

In Parkersburg, W. Va., over 50 craftsmen, tradesmen and builders have subscribed their support for the conduct of the Parkersburg Home Modernizing Bureau, recently organized.

*One of the machine shops of a prominent New England manufacturer showing one of the 55 Thermolier copper unit heaters.*

# —really costs less

A STOCK Thermolier unit heater was set up by one of New England's pioneer makers of machine tools and precision instruments, and put on test run. On the basis of this test run 55 Thermolier unit heaters were ordered and installed.

"We found by means of actual performance and condensation results," writes their engineer, "that the Thermolier actually would radiate more than sufficient heat to justify the added cost, and on this basis we purchased the Thermolier units."

Under actual working conditions Thermolier proved its higher capacity per dollar of cost in:

1. initial investment
2. expense of operation
3. adaptability
4. maintenance
5. depreciation

"There are several other items favoring the Grinnell Thermolier unit," the report read, "such as providing for suspending the unit, steam and condensation outlets and tappings for the proper pipe fittings in each case, so that a Thermolier unit can actually be installed for less money than other unit heaters not so constructed."

The variety of Thermolier installations in the various buildings of this manufacturer shows their flexibility of location. The 55 units throughout this plant are located in machine shops, company restaurants, locker rooms and storage buildings.

Fifty years heating experience in 5 cu. ft. One Thermolier weighing 200 pounds replaces two tons or 800 sq. ft. of cast-iron radiators or coil-pipes.

One-fifth the supply and return pipes. One-eighth the number of valves, traps, elbows, unions, etc.

You may care to study the Fourteen Points of Thermolier Superiority. Take the internal cooling leg, for example. It's right in the unit. And the return trap is square up against the heater itself. One ¾ in. thermostatic valve drains the unit perfectly without the usual outside cooling leg required with other unit heaters.

Booklet detailing these Fourteen Points of Superiority gladly sent on your request. And no salesman's call without your request.

**Please attach to your business letterhead and mail today.**

Thermolier
*the copper unit heater*

*Made in six sizes to fit any space and every condition*

## 14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

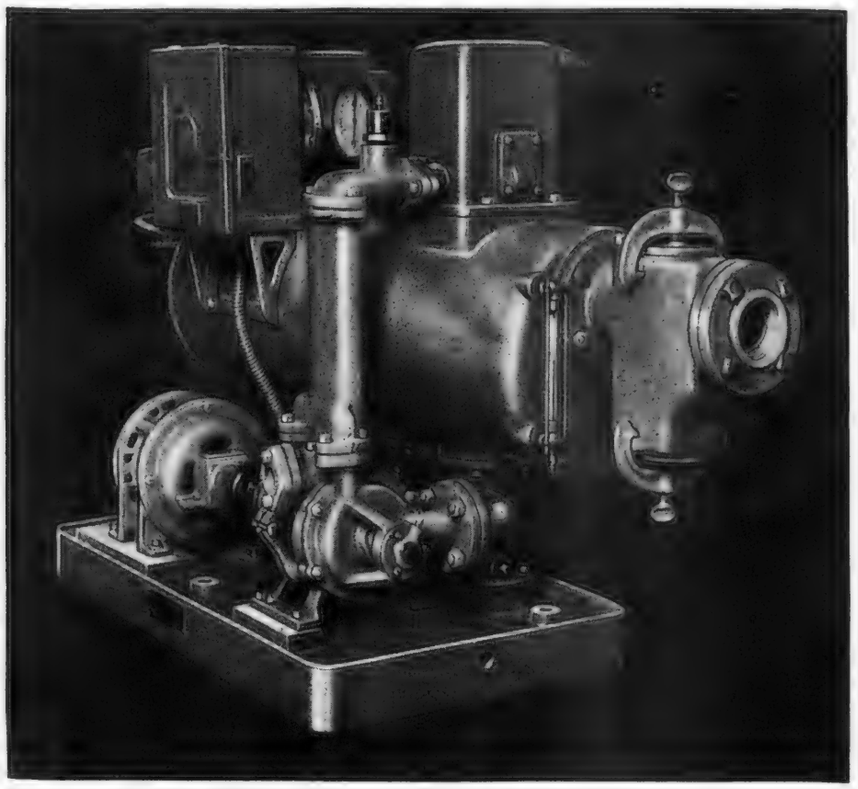
Firm Name_____

Address_____

# GRINNELL COMPANY

**Executive Office: Providence, R. I.**

***Branches in all Principal Cities***



Jennings Vacuum Heating Pumps are furnished in capacities ranging from 4 to 400 g.p.m. of water and 3 to 171 cu. ft. per min. of air. Either automatically controlled or for continuous operation. For serving up to 300,000 sq. ft. equivalent direct radiation.

# Actual delivered capacity

## *backs the published rating of this heating pump*

To keep a vacuum return line heating system operating efficiently, a definite number of gallons of water and cubic feet of air must be removed each minute. It is important, therefore, when selecting a pump for such a system, to know just how much air and water the pump will handle. Published ratings, giving merely the square feet of radiation for which a pump is recommended are of little value.

For your protection, a certified test report is furnished, when requested, with every Jennings Vacuum Heating Pump. This report gives actual working capacities—the amounts of water and air in g.p.m. and cu. ft. per min. that the pump delivered when tested under working conditions. Knowing these figures, you can be positive that a Jennings will handle the job to which it is assigned.

If you wish to make your own tests, the calibrated orifice with which the original factory test was made will also be supplied.

Bulletin 85 gives complete information on the construction and operation of the Jennings Vacuum Heating Pump. Write for a copy.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS—CONDENSATION PUMPS—COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES—STANDARD AND SUCTION CENTRIFUGAL PUMPS—HOUSE SERVICE PUMPS—SEWAGE EJECTORS—SUMP PUMPS—FLAT BOX PUMPS — MARINE PUMPS

# Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

# Trade and Miscellaneous Notes

## Coming Events

**June 10-13, 1929.** Fortieth annual convention of the Heating and Piping Contractors National Association in St. Louis. Headquarters at the New Jefferson Hotel.

**June 11-14, 1929.** Twentieth annual convention of the National District Heating Association in Detroit.

**June 22-23, 1929.** Spring meeting of American Society of Refrigerating Engineers, at State College, Pa.

**June 26-28, 1929.** Midsummer meeting of the American Society of Heating and Ventilating Engineers at Lake of Bays, Ont., Can. Headquarters at Bigwin Inn.

**October 14-18, 1929.** Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

## W. G. Hollis Becomes Vice-President of Triple Insulaire Company

Announcement is made that W. G. Hollis, formerly joint secretary-manager of the Northwestern Lumbermen's Association and the Retail Lumbermen's Insurance Association, has become actively associated with the Triple Insulaire Co., Milwaukee, Wis., as vice-president. The company manufactures Triple Insulaire, a recently-developed building insulation material.

## Heating and Ventilating Discussed at Kansas

A three-day conference was held at the School of Engineering and Architecture at the University of Kansas, Lawrence, Kans., April 8-10, under the direction of Dean G. C. Schaad.

The Kansas City Chapter of the society has been active for some time in encouraging the heating and ventilating curriculum at the university, and many of the members were present at the conference.

"House Insulation" was discussed by H. K. Ireland, of the Armstrong Cork and Insulation Company, and G. B. Glaskin, of the Kansas City Gas Company, spoke on the subject "Use of Gas for Domestic Heating." "Heating with Steam Below Atmospheric Pressure" was the subject of a paper read by C. A. Thinn, of the C. A. Dunham Company. Other papers included "The Cost of Heating with Various Fuels," by L. W. Millis, of the Security Stove and Mfg. Co., Kansas City, Mo.; "Conditioning Air for Ventilation," by E. S. Miller, of the Carrier Engineering Corporation; "The Research Laboratory as a Factor in Present Progress of Heating and Air Conditioning," by F. C. Houghten, director of the Research Laboratory of the society, and "Hot Water Service and Heat Recovery," by Mrs. O. E. Frank, president of the O. E. Frank Heater and Engineering Company.

## Gas Salesmen Hold Annual Conference

Various phases of gas salesmanship such as the economics of selling gas and gas appliances, fundamentals of domestic salesmen's compensation, selling gas refrigeration and gas house-heating were discussed at the sixth annual New York Regional Sales Conference of the American Gas Association, held May 23-25 at Montauk Manor, Montauk Point, N. Y.

J. J. McKearin, of the Lowell Gas Light Co., Lowell, Mass., spoke on the subject "What New England Has Done On House-Heating."

"Future Sales Possibilities in the Metropolitan District," were discussed by C. E. Paige, vice-president of the Brooklyn Union Gas Co., Brooklyn, N. Y. E. R. Acker, of the Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., discussed "The Mass Market for Water Heater Sales," and "The Importance of Market Analysis in the Sale of Water Heaters," was stressed in a paper by Joseph J. Genthner, Cleveland Heater Co., Cleveland, O.

## Course in Gas Engineering at University of Illinois

A short course in gas engineering has been announced by the Illinois Gas Association, to be held at the University of Illinois, Urbana, Ill., June 17-29. The course will include the necessary rudimentary work on house-heating, including estimating and forecasting of probable gas costs, and is especially designed for gas house-heating salesmen and heating and ventilating contractors who wish to become familiar with the technique involved in the installation and servicing of gas house-heating equipment. The tuition is $20.

Applications for admission to this class and requests for further information should be addressed to Dr. T. E. Layng, of the University of Illinois, or to George M. Schwaner, Illinois Gas Association, 205 Mine Workers' Building, Springfield, Ill.

## Miscellaneous Notes

**Thornton Lewis,** president of the American Society of Heating and Ventilating Engineers and of the York Heating and Ventilating Corp., Philadelphia, Pa., will sail for England on the S.S. Minnewaska, July 6, to spend about two months in England and on the Continent.

**Heating and Piping Contractors Madison (Wisc.) Association** has adopted the "Certified Heating" plan, following a meeting held recently at the Park Hotel, Madison, which was addressed by Assistant Secretary Joseph C. Fitts, of the national association. C. A. Hooper, president of the Madison group, was in charge of the meeting.

**Josiah C. Moore Corp.,** Seattle, Wash., announces the removal of its offices to 821 Northern Life Tower, Seattle.

**B. A. Schutz,** vice-president of the Central Foundry Co., New York, has resigned after an association of 27 years with that company. For many years he was connected with the company's Chicago's office and, since 1909, has been its manager. In 1924, he was elected vice-president in charge of soil pipe sales and was transferred to New York where he has maintained his headquarters since that time.

**April construction work,** reported by the F. W. Dodge Corporation, totals $642,060,500. This figure was almost the equal of the April, 1928, total and is 32% ahead of the total for March, 1929. It is the second highest April contract total on record. Analysis of last month's building and engineering record shows the following important classes of work: $256,779,700, or 40% of all construction, was for residential buildings; $152,126,900, or 24%, for public works and utilities; $77,988,400, or 12%, for commercial buildings, and $68,229,500, or 11%, for industrial projects.

In New York State and Northern New Jersey districts the total was $169,079,700, or 52% ahead of March, 1929, and 12% in excess of the total for April of last year. Of this construction 49% was for residential buildings; 27% for public works and utilities; 14% for commercial buildings and 5% for educational projects. New England reported figures of

$40,940,200, 28% in excess of March but 10% less than April, 1928. In the Middle Atlantic States the figures of $106,136,700 made the largest monthly total ever recorded in this district. Among other sections reporting notable increases was the Northwest, including Minnesota, the Dakotas and Northern Michigan. The total of $10,984,000 was double the total of March of this year and 54% gain of the total of April 1928. The other notable increase was in the Southeastern States.

## Manufacturers' Notes

**Gorton Heating Corp.,** New York, announces the opening of a branch sales office in Pittsburgh, Pa., in the American Bank Building at Sixth Ave. and Grant Street. The office will be in charge of William H. Clark, an experienced heating engineer.

**Cutler-Hammer, Inc.,** Milwaukee, Wis., has opened a warehouse in Cleveland, O., for the storage of motor control equipment.

**Bishop and Babcock Sales Co.,** Cleveland, O., has opened its own office in Boston, Mass., at 848 Little Bldg., 80 Boylston St., to serve the Boston and New England territories. The company's vacuum and vapor heating specialties and automatic temperature regulation will be handled by J. R. Rabbitt, while Richard H. Gallagher will have charge of the fan, air washer and unit heater department.

**S. T. Johnson Co.,** Oakland, Calif., has appointed Agar Cross & Co., Ltd., 901-907 Bowling Green Bldg., 11 Broadway, New York, as Johnson representatives in the republics of the Argentine, Paraguay and Uruguay, South America. In addition, The Corning Electric Co., Corning, Calif., has been appointed dealer for the Sacramento territory.

**Williams Oil-O-Matic Heating Corp.,** Bloomington, Ill., announces the appointment of M. E. Ticen as manager of the Dist-O-Stove Sales Division. Mr. Ticen was formerly with the XXth Century Heating and Ventilating Company, Monitor Stove Company and Fox Furnace Company. Increased sales of heating and refrigerating units, it is stated, have necessitated the erection of two new factory units this year.

**American District Steam Company** at its annual meeting at No. Tonawanda, N. Y., April 16, elected the following officers: President and treasurer, Robert Hall; vice-president, N. D. Fish; secretary, George H. West; assistant treasurer, H. C. Jagow. The newly elected officers of the construction subsidiary, Northeastern Piping and Construction Corporation are: President-treasurer, Robert Hall; vice-presidents, H. C. Kimbrough and Arthur J. Slade; secretary, George H. West; assistant treasurer, H. C. Jagow. Reports of the company indicate the rapid development of new district heating plants and a number of major extensions to plants now in operation.

**Wagner Electric Corp.,** St. Louis, Mo., has appointed L. G. Tandberg as branch manager of the Los Angeles, Calif., sales office at 1220 South Hope Street.

**Silent Automatic Corp.,** Detroit, Mich., has appointed Bob Pryde and T. H. Touhey, both formerly with Electrol, Inc. of Missouri, as members of the factory sales organization.

**General Electric Co.,** Schenectady, N. Y., announces the appointment of Neil Currie, Jr., as manager of its Philadelphia works. Mr. Currie for the past five years has been managing engineer of the motor department of the company's Pittsfield works. Robert V. Good, section superintendent in the Schenectady works has been named assistant to the manager at Philadelphia.

**International Burners Corp.,** New York, manufacturer of the Caloroil, Victory and Crescent oil burners, announces that it has acquired the exclusive sales agency for the Holby Burner Corporation of 300 Fourth Ave., New York. The Holby Burner Corporation will continue to manufacture its burners for the International Burners Corporation. The Holby burner, which is of the turbine gun type, having a large range of capacities and being capable of burning oil of 14° Baumé and upwards, will be used to enlarge the International line.

**Minneapolis-Honeywell Regulator Co.,** Minneapolis, Minn., has undertaken an expansion program involving an expenditure of $300,000. The program includes the construction of a new wing six stories high, which will add 50,000 sq. ft. to the present plant. At the present time the company is employing 1700 people, 800 of whom are in Minneapolis, 250 in Wabash and over 600 in various branches located throughout the country.

**U. S. Supply Co.,** Lincoln, Neb., is the new name of the Cornell Supply Company, which represents the Chicago Pump Company in that city.

**Winslow Boiler & Engineering Co.,** Chicago, has awarded the Kleen-Heet franchise for the Newark, N. J., district to Barney Miller, Newark, N. J.

**Fess Oil Burners of Canada, Ltd.,** it is announced, has amalgamated with the Service Stations Equipment Co., Ltd., of Toronto. The two companies, however, will continue to be operated as separate units.

**Spencer Heater Co.,** Williamsport, Pa., announces the following new appointments: T. F. Reusswig for the Albany, N. Y., district, with headquarters at 797 Washington Ave., Albany; E. C. Kretschman for the Bethlehem-Allentown, Pa., district, with headquarters at 84 West Market St., Bethlehem; C. F. B. Ward for the newly-established Pittsburgh district, with headquarters in the Union Trust Bldg., Pittsburgh. Associated with Mr. Ward are E. J. Davis and E. S. Schweinberg.

**New York Air Valve Corp.,** New York, has appointed A. B. Smith as its Chicago representative. Mr. Smith was formerly connected with James P. Marsh & Co., of Chicago.

**Grant Oil Burner Corp.,** New York, announces that it has taken over all of the activities of the Gulf Oil Burner Company. Heretofore, the Gulf Oil Burner Company has acted as sole distributor for the equipment manufactured by the Grant corporation. Finding its activities in the equipment field inconsistent with its oil interests, the Gulf company has sold its domestic burner activities to the Grant corporation. This includes its dealer organiations as well as the Philadelphia retail office.

A new plan of direct factory-to-dealer distribution has enabled the Grant corporation drastically to reduce the price of its domestic oil burners to dealers. Under the new plan, the Grant corporation rapidly is enlarging its dealer organiation and an unusually active year seems assured.

## Obituaries

**Charles E. Carpenter,** president of E. F. Houghton & Co., Philadelphia, Pa., died at Miami Beach, Fla., April 6, of heart disease. He was 67 years old. Mr. Carpenter at one time was identified with the heating industry through his company's manufacture of the Houghton line of steam specialties. At the time of his son's appointment as manager of the company's Paris office the young man was tendered a farewell dinner by his father at the Hotel Astor, New York, which was attended by a representative group of heating men.

**August Buschmann,** president of August Buschmann & Sons, Inc., manufacturer of heating and plumbing supplies, died May 20, at his home in Indianapolis. He was 80 years old. Born in Germany in 1848, Mr. Buschmann came to this country in 1871, after having served in the Franco-Prussian war. Engaged at first in the grocery business in Indianapolis, later he added a plumbing and heating line. So successful was this department of the business that he abandoned the grocery end and devoted his entire time to the wholesale distribution of plumbing and heating supplies. He retired from the active management of the firm several years ago.

5 Horse Power Century Type RS
Repulsion Start Induction Single Phase Motor

# High Starting Torque Low Starting Current

Century Type RS Repulsion Start Induction Single Phase Motors are particularly suited for installations where the load is hard to start . . . where unexpected static loads are frequently encountered . . . or where heavy flywheels or similar inertia loads are present.

Starting torque of all sizes is not less than 250% of full-load torque . . . starting current is not more than 260% of full-load current.

Fuses which will protect the motor while running and carrying its load are usually large enough to effect a start. Any approved single-throw switch may be used for starting, making these motors well adapted to automatic or remote control service.

*Built in standard sizes from 1/8 to 40 horse power. Temperature rating, 40° C.*

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

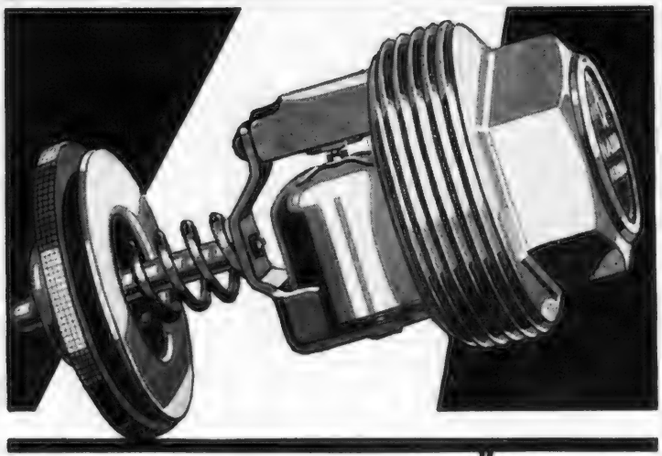
*40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof*

Century MOTORS

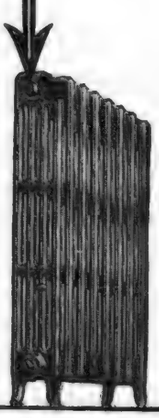
"THEY KEEP A-RUNNING"

# IN-AIRID

*The Invisible* **AIR VALVE**



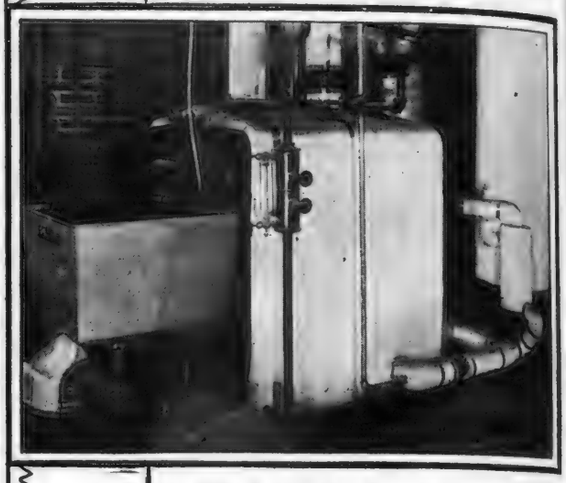
The only way to completely vent new water-for-steam radiators . . The IN-AIRID is concealed within the radiator. . can't be stolen or tampered with . . insures full venting.



No. 1
for Steam

No. 2
for Vacuum

AMERICAN RADIATOR COMPANY



## Behind the Profit– The Product. Behind that– SERVICE.

PROFITS cannot last if the products through which they are made, do not stand up. They are soon eaten up by free servicing, adjustments and dissatisfied customers. The product cannot justify the profit unless the manufacturer stands back of it to give you complete —SERVICE.

Every claim made for The ELECTRIC FURNACE-MAN is backed by an organization which has no reputation to make but has an excellent one to maintain.

Complete service and every assistance, either sales or technical, is yours for the asking. Why not let us begin by giving you a complete picture of The ELECTRIC FURNACE-MAN—what it does and how it does it?

The ELECTRIC FURNACE-MAN burns ANTHRACITE — buckwheat or rice. Used in thousands of homes. Fits any heating plant. Ideal for hot water supply.

*The* Electric Furnace-Man

*PATENTED*
*AUTOMATIC COAL BURNER*

DOMESTIC STOKER COMPANY
Gillespie Building • Seven Dey Street • New York

# NU-WAY DEALERS ARE MAKING MORE MONEY

Nu-way

## FEATURES

QUIET—A quiet fire with no flame roar.

BUILT IN A SINGLE UNIT—The controls and supply pump, once extra units, are now built in a single unit.

BURNS LESS OIL—Improved combustion makes a hotter fire with less oil.

CONTROL OF ATOMIZER PRESSURE greatly simplified which means efficient and simple control of flame size.

STRAIGHT ELECTRIC IGNITION, tested and proven dependable.

There are sound reasons for the growing sales and increasing profits of Nu-Way Dealers. There is the added prestige of another year of satisfactory service to an enlarged number of Nu-Way owners. Satisfied users are forceful salesmen . . . Mechanically, the Nu-Way stands out again this year as it did last at burner exhibits . . . Prices, sales methods and service are favorable to you. They embody the experience of one of the oldest organizations in the industry . . . These are the best selling months. Get under way at once. Write for details. Your territory may be open.

THE NU-WAY CORPORATION, ROCK ISLAND, ILL.

Nu-way

AUTOMATIC OIL-BURNER FOR HOME HEATING

# A Boiler You Can Be Proud to Recommend!

HERE is a fine boiler . . . a famous boiler . . . backed by a solid merchandising plan that is sure to make money for you.

The Pittsburg Gas-Fired House-Heating Boiler outclasses anything in its line . . . has more real improvements than any other boiler, embodying the best features of all the good ones and many special features of its own.

Most efficient gas boiler on the market. Made in 28 sizes . . . a size for every purpose . . . steam, hot water or vapor.

Don't let another day go by without sending for the "Pittsburg" proposition. We'll show you a product that has outclassed anything in its line, with a margin of profit that is satisfying. And, above all, we will show you how our sales and advertising plans can be put to work for you, making your place headquarters for gas boilers.

We'll start the ball rolling, by laying before you the fastest money-making proposition you ever heard about. Get started now. Clip the coupon and mail it today . . . while it's on your mind.

*Made and Guaranteed by*

THE PITTSBURG WATER HEATER CO.
PITTSBURGH, PA.

*Outstanding Features*

1 Spacing and design of water tubes
2 Water-Jacketed Sides
3 Non-backfiring, quiet burner with long radius venturi mixing tube
4 Safety Pilot
5 Approved Accessories

*Made by the manufacturers of the famous "Pittsburg" Water Heaters*

# Pittsburg
## GAS FIRED HOUSE-HEATING BOILER

THE PITTSBURG WATER HEATER CO.
House-Heating Division D-1 H. V. 6
Pittsburgh, Pa.

Gentlemen: I am interested in the "Pittsburg" House-Heating Boiler Send me complete catalog, trade terms, etc. No obligation whatever.

Name.....

Address.....

**Mail this Coupon for Free Catalog, Prices etc.**

# NOW

# for the first time—

**Satisfactory and fully automatic heat control for *any* building, large or small, old or new—at a cost which gives it unquestioned investment value. The economy of operation under adequate temperature control apparatus has been fully accepted by engineers. The only drawback to its use in the past has been its high cost.**

**THE Raymond Duo-Stat controls *any* heating system *automatically* by the outdoor temperature and its performance is equal to, if not superior to, any system yet devised. Because of its extreme simplicity it can be installed at a cost which makes it not only practical, but advisable in any building.**

***Send the coupon today for complete information***

## F. I. RAYMOND CO.

**228 North LaSalle Street**
**Chicago, Ill.**

F. I. RAYMOND COMPANY, 228 North LaSalle Street, Chicago, Ill.
Please send us literature describing your Raymond Duo-Stat system of control for:

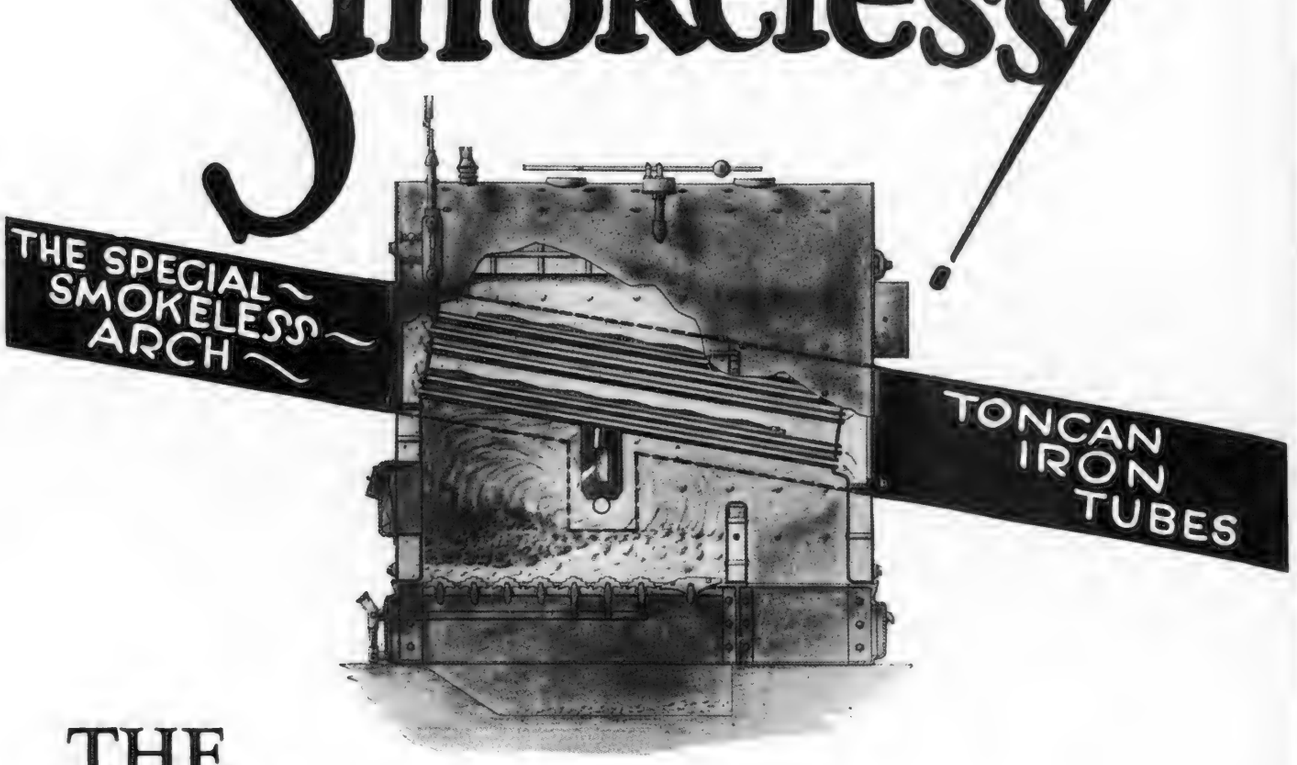
☐ Large buildings ☐ Hot water heat ☐ Oil fired
☐ Smaller buildings ☐ Steam heat ☐ Gas fired
☐ Homes ☐ Zone control ☐ Coal fired

*Company*.....

*Name*.....

*Address*.....

# Smokeless




# THE KNOWLTON BOILER

With the Knowlton "Watertoob" Smokeless Boiler, smokeless operation is assured by the Special Arch built of refractory material.

This Arch supplies preheated air to the volatiles issuing from the fresh coal.

The Famous Knowlton construction with Toncan Iron Tubes presents to the living fire the most effective of heat absorbing surfaces.

*Our new catalog will be sent upon request*

This is the Knowlton "Watertoob" Smokeless Boiler as it appears installed.

## ORR & SEMBOWER, INC.

READING, PENNSYLVANIA

208 N. Clinton St., Chicago 50 Church St., New York

COMPLETE · HEATING · SATISFACTION

# Indestructible

## *as this famous statue!*

The Statue of Liberty was intended to last forever and so it was fashioned in indestructible copper! For over forty years it has withstood the elements without the slightest disintegration. In another hundred years it will probably be in almost as good condition as it is today. *For nothing affects copper!*

Patterson Indestructo Hot Water Heaters are also made to wear indefinitely and so they are

## COPPER-LINED

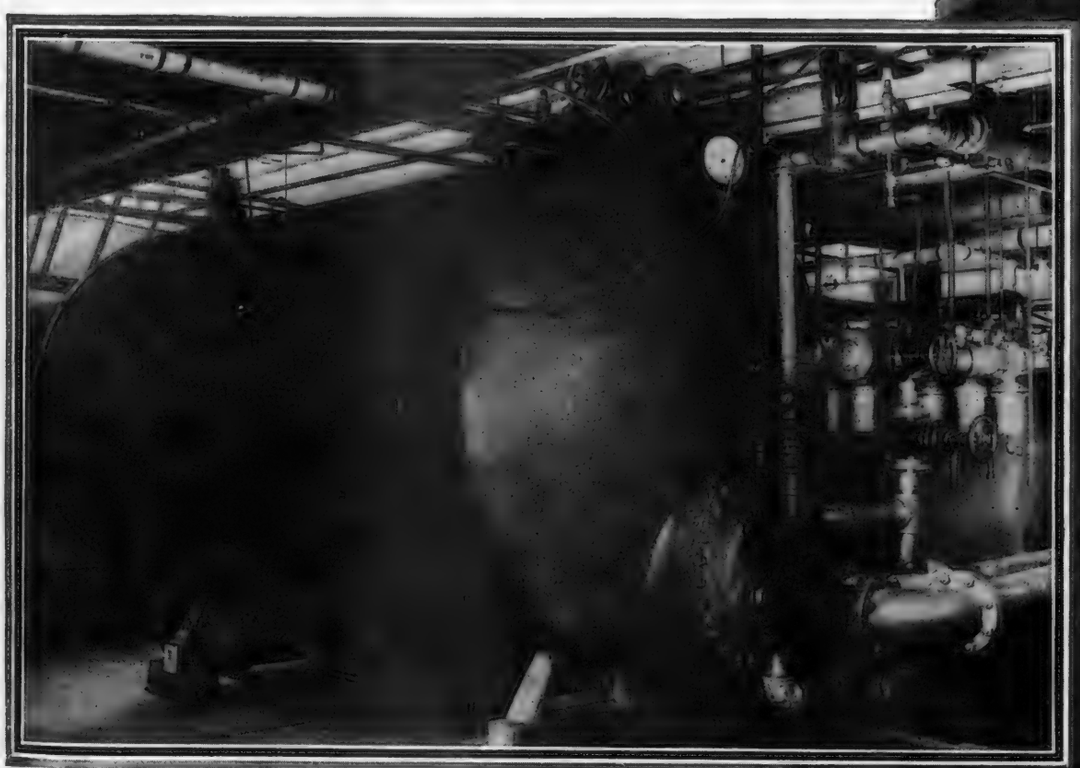
For over 20 years these Heaters have been in service without one ever wearing out. Patterson Indestructo Hot Water Service and Storage Heaters have an outer shell of steel and an inner lining of copper. Water comes in contact only with this copper lining. As copper can't rust or corrode, the hot water must always be clean. We guarantee these Heaters to prevent discoloration of water from rust.

In addition to long life, and freedom from rust and corrosion, Patterson Indestructo Heaters give all the hot water you want at the temperature you want it.

*Catalog and prices will be sent upon request.*

**The Patterson-Kelley Co.**
107 East 40th Street, New York City

**Patterson**
**Indestructo Copper-Lined Hot Water Heater**



# Forty-four Years of Proof Positive

The Johnson Service Company originated automatic temperature regulation 44 years ago.

Up through all these great many years automatic temperature regulation has grown in use, and has constantly improved under the scrutiny, field and laboratory engineering of The Johnson Service Company.

Imitating equipment, substitute devices have come and gone in this long Johnson time: inadequate, mediocre, failing attempts at temperature regulation have been not uncommon.

While The Johnson System continued, survived, and today remains as the recognized complete and thorough method of control, in principle, design and construction; apparatus, equipment and service efficiency; reliable, responsible, tried and found faithful.

The scope of The Johnson System Of Heat And Humidity Control evidences the thoroughness with which The Johnson Service Company occupies the field.

Briefly, Johnson Service pertains to the automatic regulation of temperature and humidity in homes, school, business and industrial buildings, private and public institutions of every kind.

It applies to every form and method of heating and ventilating: and the thermostatic control of refrigeration and for products requiring varying degrees of temperature in their processes of manufacture.

And it is not a device, simply an attachment or installation alone that is offered. Johnson *Service* is the all-embodying, accomplishing factor; an essential completeness for permanency and the required results.

**". . . . the system in our building became very unsatisfactory, and after considerable worry and expense at attempts to have it repaired we had the system removed and The Johnson System installed . . and we find Johnson equipment and service satisfactory and complete in every way."**

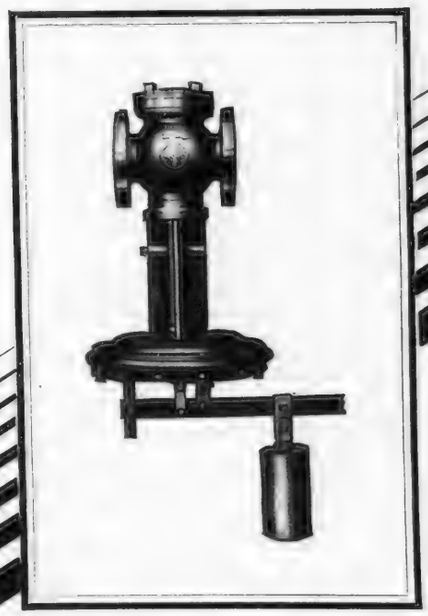
Name Of Writer On Request.

JOHNSON SERVICE COMPANY
MILWAUKEE, . . . . WISCONSIN
ESTABLISHED 1885.
BRANCHES IN ALL PRINCIPAL CITIES.

**JOHNSON HEAT & HUMIDITY CONTROL**

The All Metal System . . . .
The All Perfect Graduated
Control of Valves & Dampers

The Dual Thermostat (Night and Day)
System Of Control. . . . . .
Fuel Saving: 25 to 40 Per Cent Per Year.



*Mason No. 236 Lever Style Reducing Valve for Heating Systems*

# —A Fair Profit and a Satisfied Customer

**With these essentials, the Mason 236 Lever Style Reducing Valve offers you a wonderful opportunity to do things.**

**Quickly and easily installed on old or new jobs.**

**No servicing, no come-backs. This means satisfaction to you and your customer.**

**Operates on any initial pressure up to 125 pounds and delivers a constant, uniform reduced pressure of 0 to 10 pounds or 5 to 25 pounds.**

**Easily set, easily reset to any reduced pressure within its range.**

**Simple, sturdy, fool-proof.**

**The Mason 236 Reducing Valve is just one of the dozens of unusually good Mason Reducing Valves to meet every service need and most every price demand.**

***They're all in our catalog. Send for a copy and our proposition.***

## MASON REGULATOR CO.

**1190 Adams St., *Dorchester Centre Station***
**BOSTON, MASS.**

MASON

Mason Regulators

In Canada: MASON REGULATOR COMPANY of CANADA, Ltd., 686 Notre Dame Street, W., MONTREAL, QUEBEC.

*52 Years of service in the Plumbing and Heating Industry*

Standard Bronze Gate Valve

Standard Iron Body Gate Valve

Radiator Valves

Hot Water Type

Steam Type

# There's a Kennedy type for every valve and fitting requirement

ONE of the many advantages of standardizing on Kennedy Valves and Fittings is the completeness of the Kennedy line. The wide range of sizes of gate, globe, angle, and check valves, in bronze, iron body, all iron and steel, for steam, water, air, oil or gas, at low, medium or high pressures, together with the many types of malleable iron and bronze pipe fittings manufactured by Kennedy provide a selection for practically every plumbing, heating or power plant job.

Each Kennedy product is designed with special reference to convenience and economy of installation and dependability of operation. Kennedy Valves and Fittings help to assure creditable installations, and the results being obtained by their use in thousands of public, commercial and residential buildings, power plants, industrial plants and water supply systems testify to their excellent design, sturdy construction, and lastingly satisfactory service.

The Kennedy Valve Mfg. Co.
Elmira, New York
New York Philadelphia Cleveland Atlanta
Chicago Salt Lake City El Paso Los Angeles
Seattle San Francisco

*Send for the Kennedy Catalog*

Back-Water and Sewer Gas Valve

Malleable Iron Pipe Fittings

Bronze Pipe Fittings

KENNEDY

VALVES—PIPE FITTINGS—FIRE HYDRANTS

*St. Louis, Mo., is justly proud of its new Coliseum Pool, built by the Natatorium Construction Co. of New York*

# In the Sparkling Green Waters of a "National"---Warmed Pool

How invigorating a swim with the water "just right"! The thousands who play in the Coliseum pool are regular visitors for they are always sure to find the temperature of the water to their liking.

*National Heaters are giving excellent service in Schools, Hotels, Clubs, Apartment Houses, Colleges, Gymnasiums, Y.M.C.A.'s, Office and Municipal Buildings.*

The responsibility of maintaining the temperature evenly in this pool (and many others) is rested in National Instantaneous Heaters designed specially for swimming pool service. Like all National heating units, once installed they are absolutely reliable and go on functioning with no further thought or care.

NATIONAL
U BEND TYPE
Instantaneous
HEATERS

National gives in design, construction and materials all that can be desired. The absorbing element in the heater is pure copper seamless drawn tubes expanded into forged steel tube plates. The entire element is easily removed as a unit. Shells are of steel or cast iron.

National Instantaneous Heaters will efficiently heat the water as it flows into the pool or will reheat the pool water to maintain it at a given temperature.

We recommend the National for your next pool. You will get an individually engineered installation that will deliver all and more than the specifications call for.

National Heaters are the product of the oldest and most progressive organization in the field, with 46 years of engineering experience behind it. We invite your inquiries and will be pleased to send our engineers to consult with you. Write for Bulletin No. 56.

**THE NATIONAL PIPE BENDING CO.**
**Established 1883**
**120 River St., New Haven, Conn.**
**Boston New York Philadelphia**

## The Standard Heater for Swimming Pool Service

# HORNUNG

# *Master Control System for large buildings*

***Design*** The Hornung Master Control is built on some definite principles involved in the distribution of steam for heating. Fundamentally it is based, first, on the fact that the available mean effective temperatures of steam do not meet the entire range of requirements and, second, that buildings involving space used for a variety of purposes requiring different temperatures or having different hours of occupation cannot be economically controlled from one Central Equipment.

***Observation*** A great number of observations show clearly the limitations of vacuum in supplying the proper mean effective temperature in the radiators in order to emit the correct amount of heat for any given requirement. It may be noted that for a properly determined amount of radiation to satisfactorily heat a given space (70° at 10° below zero), the mean effective temperature of the radiator for 50° outside corresponds to 25" vacuum. The following table gives comparisons for various temperatures based on normal requirements and this without the ever present wind and sun factors:—

| Outside Temp. | Inside Temp. | Corresp. Vac. in Rad. |
|---|---|---|
| 50° F. | 70° | 25" |
| 30° F. | 70° | 20" |
| 16° F. | 70° | 15" |
| 7° F. | 70° | 10" |
| 0 | 70° | 5" |

The temperature-vacuum table given above indicates that there are many hours during the heating season when mean effective temperatures in the radiation cannot be lowered far enough to meet the proper balance between heat emitted from radiator and heat required to maintain desired room temperature. It follows logically that we must either overheat, or shut off the supply of heat until heat is again wanted.

***Relation between Temperatures*** Following is a table showing M. E. Temperatures in radiator expressed in vacuums above which overheating will begin if not shut off:—

Room Temperature 70°

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 25" | Vacuum | requires | on | and | off | above | 50° | outside |
| 20" | " | " | " | " | " | " | 30° | " |
| 15" | " | " | " | " | " | " | 16° | " |
| 10" | " | " | " | " | " | " | 7° | " |
| 5" | " | " | " | " | " | " | 2° | " |
| 0" | " | " | " | " | " | " | 7° | " |
| 1½ | Pressure | " | " | " | " | " | 10° | " |

It follows that for any other inside temperatures the shut-off temperatures will vary so that it becomes obvious that the final control must rest in a thermo device placed in space to be controlled.

***Overheating Prevented*** Economic operation consists wholly in furnishing at all times sufficient heat, but not in excess of that required. Excess heating occurs when inside temperatures rise above those required or desired, be they 40, 50, 60, 70 or 80°. Excess heating occurs also when periods of non-ocupation carry the same temperature as do periods of occupation, IF NOT REQUIRED.

***System*** We now turn to the most practical method of securing the most practical results, and to do this we employ any standard vacuum system of heating, approved and used for many years on all types of buildings and for every requirement. We incorporate with these systems a system of control valves called MASTER CONTROL. A survey of building or buildings to be heated tells us how to Zone the buildings:—

1. As to occupation temperatures desired.
2. As to time (program and cycle).
3. As to wind and sun conditions.
4. As to geographic location of building.

***Zoning*** It then becomes a simple method to design the system to supply separately the Zones as developed and to install a Control Valve in each supply. These valves are opened and closed by means of Master Thermostats located at representative points. These Control Valves not only prevent overheating, but they control in the same valve (patented) the pressures separately to each Zone so that the entire system responds perfectly to what is sometimes called balancing.

***Thermo-manual Control*** A central Control panel may be located in Engineer's office or operating room so that with switch and signal light the Engineer can manually throw valves (individually) to open or closed position or to "Automatic" Control. The signals tell at all times the exact "On or Off" of valves and thermostats.

***Interconnection for Group Control*** A Master Control System employing a number of valves may further be so interconnected for Automatic Fuel Burner operation that when the first valve of the group opens the Fuel Burner circuit is closed and Burner operates automatically, and when the last valve closes the Burner circuit opens and Burner stops if running. Additional Fuel Burners or Vacuum Pumps on the system may be likewise controlled all from the switch mechanism on Zone Control Valve.

Finally, the system may be operated at the most practical vacuum for any particular installation. This results always in most economical operation. The System is extremely simple in design and likewise in operation. The System employs time tried equipment, devices and controls throughout.

---

Particulars or further information may be obtained without obligation—from

***Central Heat Appliances***
***Fisher Building***
***Chicago, Ill.***

# *The Silver Anniversary of* Heating and Ventilating

## COME and SEE

## *Time to look back—and forward*

Less than a quarter century ago, the pot-bellied stove was a piece of factory equipment.

It's a still shorter step back to the birth of scientific ventilation.

It's but a few yesterdays since effective air conditioning emerged from its go-cart.

As the heating and ventilating industry has developed, this magazine has interpreted its progress and its future.

It seems fitting that the year of the twenty-fifth anniversary celebration be marked by the first great International Heating and Ventilating Exposition at Philadelphia, next January from the 27th to 31st.

This exposition will interpret the industry to the public, create confidence in and desire for the products exhibited, stimulate the industry itself to still greater effort.

At this outstanding exposition, under the auspices of the American Society of Heating and Ventilating Engineers, you will see

—The net result of all progress to date in the Heating, Ventilating, Air Conditioning field.

—The latest and best equipment offered by the leading manufacturers.

—The most efficient and up-to-date auxiliary equipment.

—The best materials, instruments and tools.

—Outstanding applications of Heating and Ventilating developments to industrial and home use.

Come and see.

—Come to ask questions of the specialists in attendance at each exhibit.

—Come prepared to place your problems before them.

—Come for the opening day.

—And stay to extract the wealth of helpful information you will find.

# International Heating and Ventilating Exposition

**Under the auspices of American Society of Heating and Ventilating Engineers**

**COMMERCIAL MUSEUM, PHILADELPHIA, January 27 to 31, 1930**

***Management International Exposition Co., Largest Industrial Exposition Organization in the World.***

2952B

## *Prepared— and on the Offensive!*

Charavay Propeller Fans are prepared to face stiff conditions. The overlapping propeller blades take big, deep "bites" into the air and are on offensive from the start. Charavay really puts "teeth" in industrial ventilation! Really *does a job* of it.

### *A Typical Example*

In Philadelphia, the White & Moore Foundry wanted infallible ventilation. Two Charavays were installed, alongside other ventilating equipment. The Charavays showed "teeth" as soon as the hook-up was completed. Farther away from the smoke and bad air than the others, the Charavays actually pulled the smoke right past the others and whirled it out with military precision. On the offensive because they were prepared for it! They really put "teeth" in White & Moore's ventilating system. And now they say, "No money could buy them if we could not replace them."

*It took*

# CHARAVAY

# PROPELLER FANS

## —to put "teeth" in Industrial Ventilation

Not only can you save 20% to 80% on power by installing Charavays, you can buy and install them for far less money. Let us tell you more of Charavay in your particular industry. —Write nearest distributor—or us.—

---

LIST OF DISTRIBUTORS

Belanger Fan & Blower Co., 1343 Sherman Street, Detroit, Mich.
Cross Ventilating Co., 608 S. Dearborn Street, Chicago, Illinois.
G. S. Faries, 21 Transportation Building, Philadelphia, Pa.
W. W. Johnston, 333 Hadley Road, Dayton, Ohio.
The Wm. P. Little Co., 1535 Main Street, Stratford, Connecticut.
Carroll B. McGaughey, 111 Marietta Street, Atlanta, Georgia.
Missouri Ventilating Equipment Co., 3138 Olive St., St. Louis, Mo.
Pittsburgh Electric & Machine Wks., 1 Barker Place Pittsburgh, Pa.
P. H. Rogers, 505 Bell Block, Cincinnati, Ohio.
Simpson & Sprenger, 354 Hobart Street, Oakland, California.
Steen Fan & Blower Co., 325 Ellicott Square, Buffalo, New York.
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The F. M. Webber Co., 2148 Graybar Building, New York, N. Y.
J. W. Thompson, 505 Franklin Street, Peoria, Illinois.
Northwestern Fan & Blower Co., 447 Virginia St., Milwaukee, Wis.
M. P. Ziegler & Co., 1690 N. Limestone Street, Springfield, Ohio.

*Product of*

# Hartzell

**PROPELLER CO**

**Division of Hartzell Industries, Inc.**

**616 CRAFT ST., PIQUA, OHIO**

# 8 Reasons Why you should Buy or Specify ILG Blowers

(DIRECT CONNECTED)

1. **Compact Design.** From the standpoint of compactness — economy of space, the ILG Direct Connected Blower is an innovation. The principal feature that makes for compactness is the built-in motor which is placed in the housing of the blower. Therefore, no extra pedestal or support of any kind is required.

2. **Housing.** The sides of the ILG Blower are made of cast iron with sheet steel scroll, put together with heavy duty cap screws, forming a rigid foundation for motor or bearing bracket. Both sides are alike making it easy to place motor on either side giving right or left hand drive.

3. **Simple Construction.** The ILG Direct Connected Blower is a notable example of simplicity in modern engineering. The construction and materials used are a departure in present day manufacturing, combining super-strength with minimum weight and unusual flexibility in placement and discharge.

4. **Ball Bearing Motor.** The ILG motor is distinctly an ILG product especially designed for blower drive by ILG engineers and made complete in the ILG factory according to the ILG standard. Each motor is tested with the blower on the same electrical current for which it is built and under actual load conditions.

5. **Dependable Efficiency.** The experienced engineer will recognize that the ILG Blower is built to secure the highest efficiency with reasonable quietness at highest speeds. It has the strength to withstand the stress and strain of heavy loads and can be relied upon to perform perfectly.

6. **Wheel.** The wheel used is a multi-blade type made of special Whiting ribbon steel. It can be easily removed by taking off the inlet flange. Blades are electrically welded — one piece steel retaining rings, and cast steel spider. It is mounted on motor shaft — no bearings, no aligning, affording perfect balance and unobstructed inlet.

7. **Easy to Install.** The ILG Direct Connected Blower is completely assembled at the factory and placed on skids for shipment. After being rolled into place, the skids are knocked off, the four legs bolted down and the installation is complete. It can be changed on the job to right or left drive with any discharge.

8. **One Responsibitity.** The supreme feature of the ILG Direct Connected Blower is the one factory responsibitity. The ILG motor and blower are guaranteed as a complete unit. There's no split responsibility between the blower and motor manufacturer. We build under one roof a complete line of motor driven fans and blowers.

*Clip, sign and mail the coupon for the new illustrated Ilg Blower Bulletin.*

**ILG ELECTRIC VENTILATING CO., 2858 North Crawford Avenue, CHICAGO, ILL.**

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

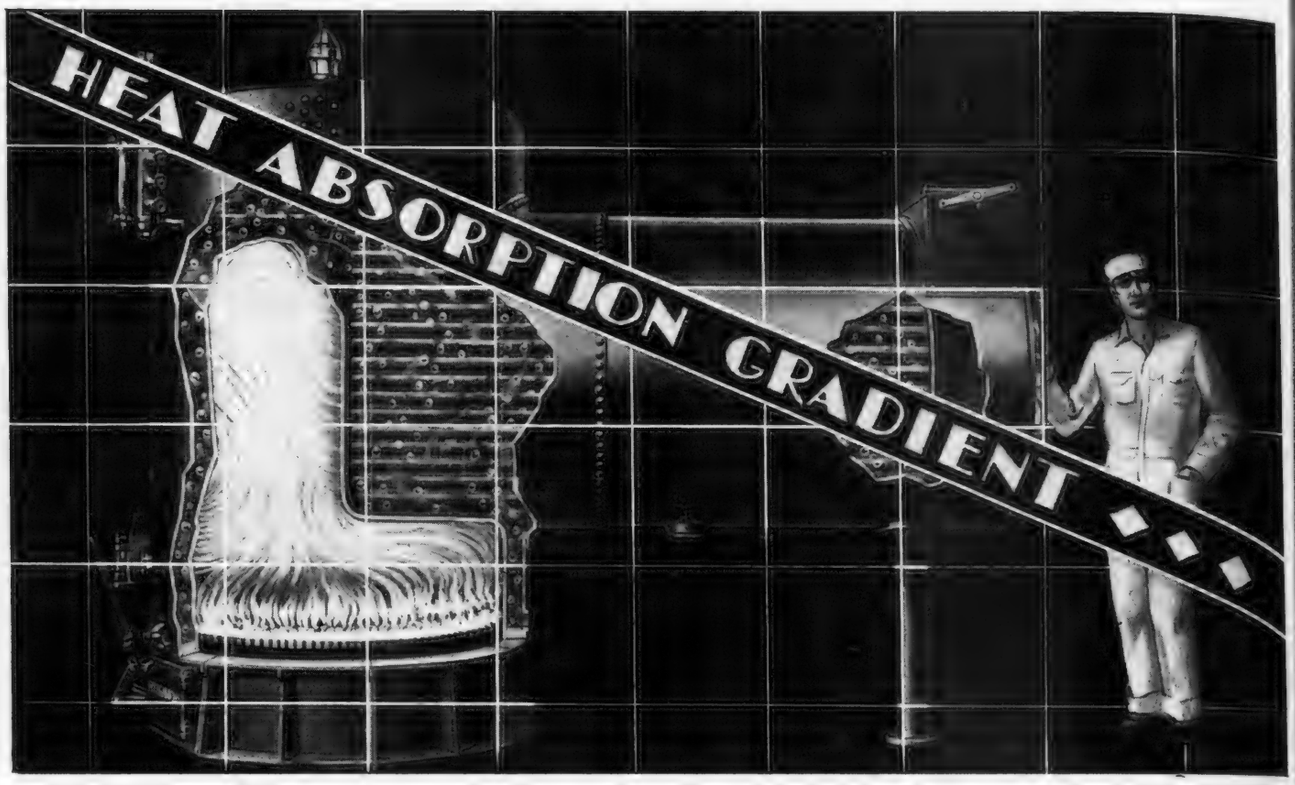
*Ventilation for Offices, Stores, Factories, Restaurants, Theatres, Public Buildings, Homes, etc., etc.*

**COUPON**

Without obligation send me a copy of your new ILG Blower Bulletin.

Name _____

Full Address _____




# HIGH IN HEAT TRANSFER

WALK into the boiler room of any big building where Fitzgibbons steel boilers are giving, day and night, year 'round fuel saving service.

Look in the combustion chamber—an even spread of intense glowing heat. The temperature is at the maximum in that fiery vault. Now walk to the other end of the Fitzgibbons Boiler—lay your hand on the rear flue door—you can rest it there. Open the flue doors. Still no great heat. What more simple and convincing evidence of the high heat transfer of Fitzgibbons Steel Boilers? The heat has been absorbed by the water.

Fitzgibbons Steel Boilers are of distinctive design to secure maximum heat transfer. Of multiple fire tube single flue pass design they are quick steaming. They have repeatedly demonstrated fuel savings of 20% to 40%. Their maintenance cost is nil.

Available in any size from 300 sq. ft. to 36,000 sq. ft. steam rating, they come to the job complete, tight, set-up, ready for service. Minimum installation costs and maximum fuel economy make Fitzgibbons Boilers the first choice of both contractor and owner.

FITZGIBBONS BOILER COMPANY
570 SEVENTH AVENUE, NEW YORK CITY
*Works: Oswego, N. Y.*

BRANCHES AND REPRESENTATIVES
Baltimore
Boston
Bridgeport
Buffalo
Detroit
Louisville
Pittsburgh
Pittsfield

# FITZGIBBONS STEEL BOILERS

BRANCHES AND REPRESENTATIVES
Philadelphia
Reading
Richmond
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San Antonio
Syracuse
Winston-Salem

Two No. 35 Excelso Water Heaters Supplying 50-Family Apartment, the Northcliffe, Highland Park, Mich. E. C. Thyllin, Architect. Ralph P. Peckham, Plumbing and Heating Contractor, Detroit, Mich.

Open view of triple coil heater

*Removable* copper coils with patented ground joint brass connections — exclusive with Excelso Water Heaters. There is no substitute for Excelso in design or profit.

YOU can class a product by the company it keeps. The better plumbing and heating contractors everywhere depend on Excelso for perfect performance and liberal profits.

Write for catalog showing fourteen typical installations and giving valuable fixture and tank capacity information.

*Excelso Products Corporation*
DIVISION OF AMERICAN RADIATOR COMPANY
*59 Clyde Ave.* *Buffalo, N. Y.*

***Nationally Distributed by Leading Wholesalers and Boiler and Radiator Manufacturers***

# EXCELSO WATER HEATERS

## Sold by All Plumbers and Steamfitters

SIZES FOR ONE FAMILY OR ONE HUNDRED FAMILIES

150 Pounds Pressure CRANE VALVES 2500 Pounds Pressure

# Behind the skylines
## of the new American cities

"AN architecture that promises some day to be known as that of the twentieth century," said Bernard Boutet de Monvel, French artist, two years ago in giving his impressions of a visit to America.

So rapid has been building progress in American cities in the two years since, that Boutet de Monvel's prediction may already be said to have become a fact. On the changing skyline of these cities has appeared a distinct new architectural form, the set back skyscraper that seems to have grown inevitably out of modern requirements.

But the full story of the advancing art of American building is not told simply by looking at the new buildings' exteriors. Back of their walls is a net work of valves, and fittings and piping and engineering appliances. In these also, every year is bringing new progress. Without them, the new skyscrapers themselves would be scarcely practicable.

For the fact that American buildings are not only bigger than have ever been known before but more healthy and comfortable and convenient to occupy, the credit belongs to the heating and ventilating and plumbing engineers and the industries that serve them.

CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO
NEW YORK OFFICE: 23 W. 44TH STREET
*Branches and Sales Offices in One Hundred and Eighty Cities*

150 Pounds Pressure CRANE VALVES 2500 Pounds Pressure

# Contributing for 25 years

## to a common cause

WITHOUT scientific heating and ventilating, the world would be hard to imagine. Yet if it were not for the makers of heating and ventilating supplies, these conveniences would not exist. And were it not for such a publication as *Heating and Ventilating Magazine*, the newest of the arts which contribute to comfort and health would have been slower to reach its present high state of development.

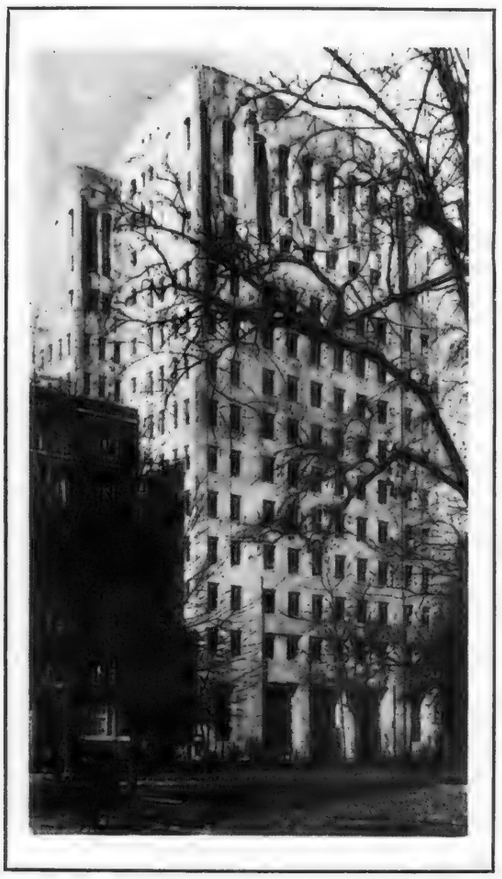
Seventy-four years ago Crane Co. manufactured its first materials in the service of heating. Twenty-five years ago *Heating and Ventilating Magazine* published its first issue. For a quarter of a century these two institutions have grown side by side. Each making its own contributions to a common cause.

Now Crane Co. rejoices in the opportunity of congratulating *Heating and Ventilating Magazine* on its twenty-fifth anniversary. And welcomes this chance to voice its appreciation of the splendid work its editorial staff has accomplished in winnowing and sowing ideas that materially stimulated the growth of the industry.

CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO
NEW YORK OFFICE: 23 W. 44TH STREET
*Branches and Sales Offices in One Hundred and Eighty Cities*

# A Monument of Success



N. W. AYER BUILDING
WEST WASHINGTON SQUARE
PHILADELPHIA, PA.

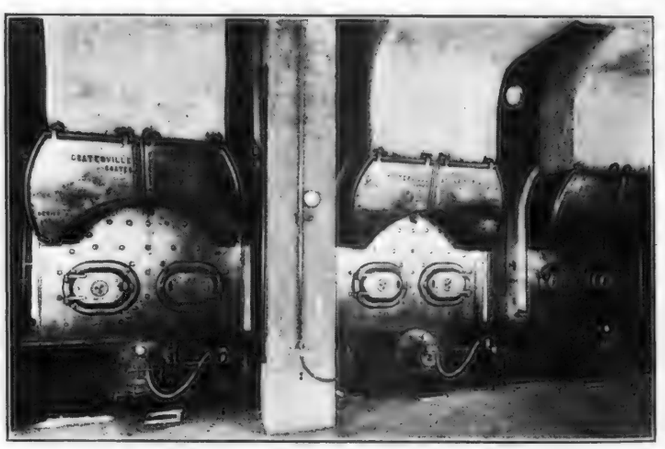
RALPH B. BENCKER
*Architect*

KETCHAM & MCQUADE
*Builders*

WM. M. ANDERSON
*Heating Contractor*

## COATESVILLE STEEL HEATING BOILERS

have been selected for the new N. W. Ayer & Son Co. Building. This is the first building in the world used exclusively for advertising.



3—Coatesville Series A-175 Boilers, Oil Fired

COATESVILLE BOILER WORKS
Boilers - Tanks - Steel Plate Work

| PHILADELPHIA | PITTSBURGH | NEW YORK | BALTIMORE | SAN FRANCISCO | BOSTON | NEWARK |
|---|---|---|---|---|---|---|
| 111 S. 15th St. | Union Trust Bldg. | 30 Church St. | Lexington Bldg. | 16 California St. | 141 Milk St. | 60 Park Place |

Main Office and Works—COATESVILLE, PA.

# This OPPORTUNITY May Never Again Be Open!

EARLIER in the year this company determined to admit not less than fifty dealers into a factory profit-sharing partnership arrangement. Before the first advertisement appeared, four of these franchises were snapped up. Within thirty days after the first advertisement, nine more dealers enlisted under this profit-sharing plan.

Today there are just a few more of these franchises available, and when they are gone, this profit-sharing opportunity may never again be open. For the first time in the history of the industry, a manufacturer is taking dealers into partnership on a profit-sharing plan that has been termed "a most unusual and liberal plan." No dealer is called upon to risk one penny, and those who are accepted under this arrangement automatically place themselves in line for a substantial share of the factory profits.

In a very short time the oil burner season will be in full swing. Those who now join this organization will be in time to get in on the peak season business. The first thing to do is to get full particulars about this offer. This corporation in 1928 had a most profitable year. Already 1929 is far ahead of 1928. Write today for the details of this franchise and profit-sharing plan.

**May Oil Burner Corporation**

**Baltimore Maryland**

MAY OIL BURNER CORP.
Baltimore, Md.

GENTLEMEN:

Please send me the details of your profit-sharing franchise plan.

*Name*.....

*Address*.....

OH 6-29 SE 6-29 H&V 6-29

# CONSTANTLY IMPROVED for 25 YEARS

*to meet*

## PRESENT DAY REQUIREMENTS—

# *The Cadillac Condensation Meter*

*Photograph showing Cadillac Condensation Meter with latest Demand Meter Attachment.*

1929

The new Cadillac Demand Meter attachment meets the most exacting needs of the heating industry today. The Demand Meter is equipped with a seven-day wax chart and clock-work control for re-setting of stylus at regular predetermined intervals.

1922

The old Detroit Meter took on a new name—Cadillac. This new name was accompanied by many improvements which have earned money for those concerns who have adopted Cadillac Condensation Meters as their standard equipment.

1906

1906—a long time ago to be sure. However the old Detroit Meter was a worthy ancestor of the more modern Cadillac Meter and its fundamentally sound principles keep many of them still in daily service.

PROGRESS CHART

Consists of a cylindrical copper metering drum revolving on roller bearings in a cast iron case.

Since central heating has become so widespread, steam is almost universally sold on a metered basis and the economy of the accurate records which the Cadillac Meter provides are of monetary value to all producers of steam.

Cadillac performance guarantees accuracy under varying conditions of flow and pressure combined with simplicity, continuous functioning, convenience and economy of operation and maintenance.

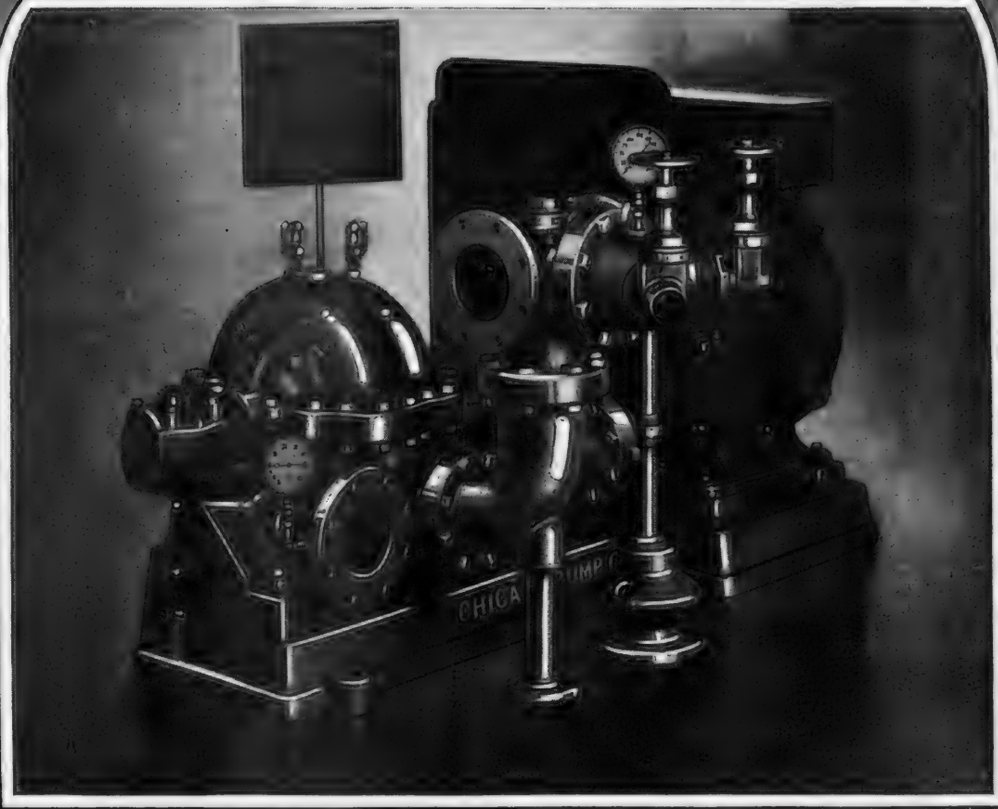
### TYPES and SIZES

Cadillac Meters are supplied in two types—gravity and vacuum. However, the gravity type may be easily changed to a vacuum type and vice versa if a change of conditions makes this advisable. The Cadillac Meter is built in seven different sizes, covering every load requirement.

***We invite correspondence regarding the application of Cadillac Meters to your special problems. Write for catalog.***

CENTRAL STATION STEAM CO.
DETROIT, MICHIGAN

# "CHICAGO" Fire Pumps are Underwriter Approved!



CHICAGO Fire Pumps are built in single and multiple stages, horizontally split and equipped with fittings as required by the Underwriters and Local Fire Authorities—and in capacities and heads as required.

Electric Motor driven pumps are the rule, but Gas Engine driven Pumps for auxiliary or suburban use are manufactured too.

CHICAGO Booster Pumps and Tank Filling Pumps are also "Underwriters Approved." Engineering data and layouts for installation provided by our Engineers. Specifications and tables are listed, together with other information in Fire Pump Bulletin No. 104.

*The first Ball-Bearing Fire Pump to be approved was a "Chicago."*

1909 1929
20 YEARS PROGRESS
"FOR WHICH WE THANK YOU"
CHICAGO PUMP CO

## CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

2348 Wolfram Street, Chicago 79 Madison Avenue, New York
Representatives in All Principal Cities

# SHUNT STEAM METERS

## Have Exceptionally Wide Range of Accuracy

Shunt Meter, Type K S
for Steam, Air or Gas

District Heating Companies, especially, are interested in the wide range of accuracy which is one of the features of the Shunt Meters. They are guaranteed accurate within plus or minus 2% over a 10-1 range at all pressures and at higher pressures they are accurate during temporary overload periods.

In addition they are easily installed between flanges in the pipe line and register the total flow in pounds of steam.

Finally they are low-priced so that they can be economically installed even in small pipe lines.

**Bulletin 234, price list, data sheet and capacity lists will be sent upon request.**

## BUILDERS IRON FOUNDRY

*"Builders of the Venturi Meter for 36 years."*

11 Codding Street - Providence, R. I.

# There is a way to make "Every day a *good* day"

***Carrier Manufactured Weather is freeing industries from daily and seasonal weather variations — is creating healthful conditions for people within doors.***

THEATRES—hotels—offices—department stores — wherever people gather, Carrier Manufactured Weather is providing pure, cleansed air at the condition of temperature and humidity contributing most to healthful comfort and efficiency.

Factories too, in more than two hundred industries have turned to Manufactured Weather for the controlled drying and processing of materials, for control in manufacturing weather-sensitive products, for uniform production for reduced spoilage, for the health and efficiency of workers.

Manufactured Weather, the science of Air Conditioning, has been developed and applied in industry by Willis H. Carrier and his associates. And through this science industry has profited enormously. Often a system has *paid for itself the first year.* More startling returns are common, considering only material gains in production. To this must be added the tremendous value of the heightened efficiency and morale of employees working—winter and summer—in a healthful, comfortable atmosphere.

To manufacturers, owners and operators of public buildings—to architects and engineers—the services, equipment and long experience of Carrier Engineers are offered in the solution of indoor weather problems.

WILLIS H. CARRIER

Through careful scientific research he discovered and formulated many important laws governing the moisture and heat properties of the atmosphere. He initially developed and applied much of the equipment and the instruments which today are creating and controlling any desired conditions of temperature, humidity and air movement within buildings. He invented and brought to its present state of perfection Carrier Centrifugal Refrigeration.

SOME NOTABLE USERS *of* CARRIER SYSTEMS

House of Representatives
in the Capitol at Washington
Roxy Theatre, New York
Schrafft Chocolates
Gillette Razors
Wrigley's Gum
Postum Cereals
National Broadcasting Studios
Camel Cigarettes
Bayuk Cigars

## CARRIER ENGINEERING CORPORATION

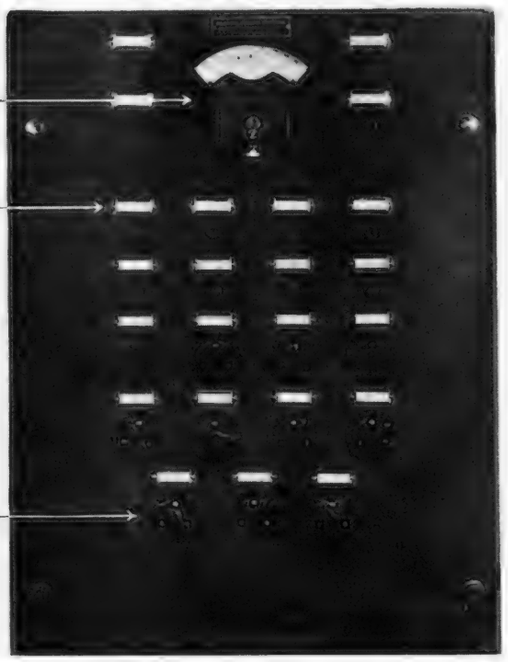
NEWARK, NEW JERSEY

OFFICES: NEW YORK · PHILADELPHIA · BOSTON · CHICAGO · CLEVELAND
WASHINGTON · KANSAS CITY · LOS ANGELES

CARRIER ENGINEERING CO., LTD.
LONDON, PARIS, BOMBAY, JOHANNESBURG

CARRIER LUFTTECHNISCHE GESELLSCHAFT
STUTTGART, GERMANY

Manufactured Weather *makes* "Every day a *good* day."


Temperature Indicator.
Indicator reports exact inside and outside temperature of each zone.
Register Signal for Zones.
One of 11 switches to determine instantly zone temperature inside and out.
Dial Control.
For setting steam valve to provide any required temperature in each of 11 zones.

## CONTROL CENTER BOARD

in boiler room of United Shoe Machinery Corporation's new plant, provides for register and control of 11 heating zones.

# Lowest First Cost, Lowest Maintenance, Lowest Steam Consumption

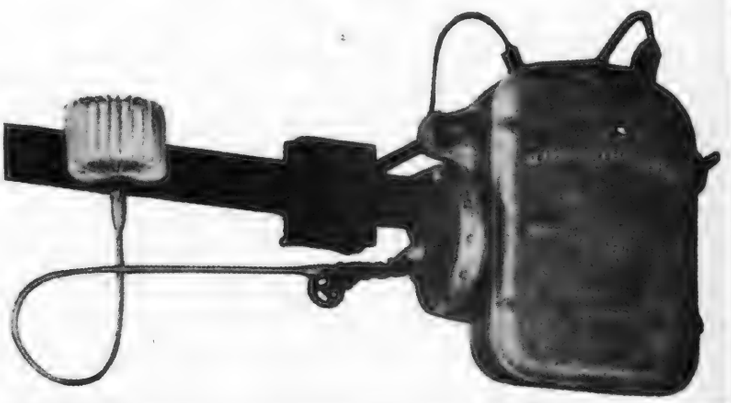
Tallmadge Control Heating System was adopted for the United Shoe Machinery Corporation's new plant. The heating is divided into eleven zones. The zones were strategically located to supply steam to the different sides and parts of the building, according to outside temperature, weather conditions and interior requirements.

The system is designed to operate at a maximum capacity with low pressure, without vacuum, thereby using all the available heat of the steam in the radiator.

The system operates by an electrical remote control, thus allowing any one of the eleven zones or steam admission valves to be regulated merely by turning a dial on central control board located in the boiler room, or any convenient place.

This increase in heating efficiency produces a real saving in steam consumed and allows unused parts of the building to be shut off. Large savings in installation can be made due to the smaller size pipe required and absence of radiator traps and vacuum pumps.

Illustration of valve mechanism which controls each of 11 zones by graduated steam supply.



# ZONE HEATING and CENTRAL CONTROL

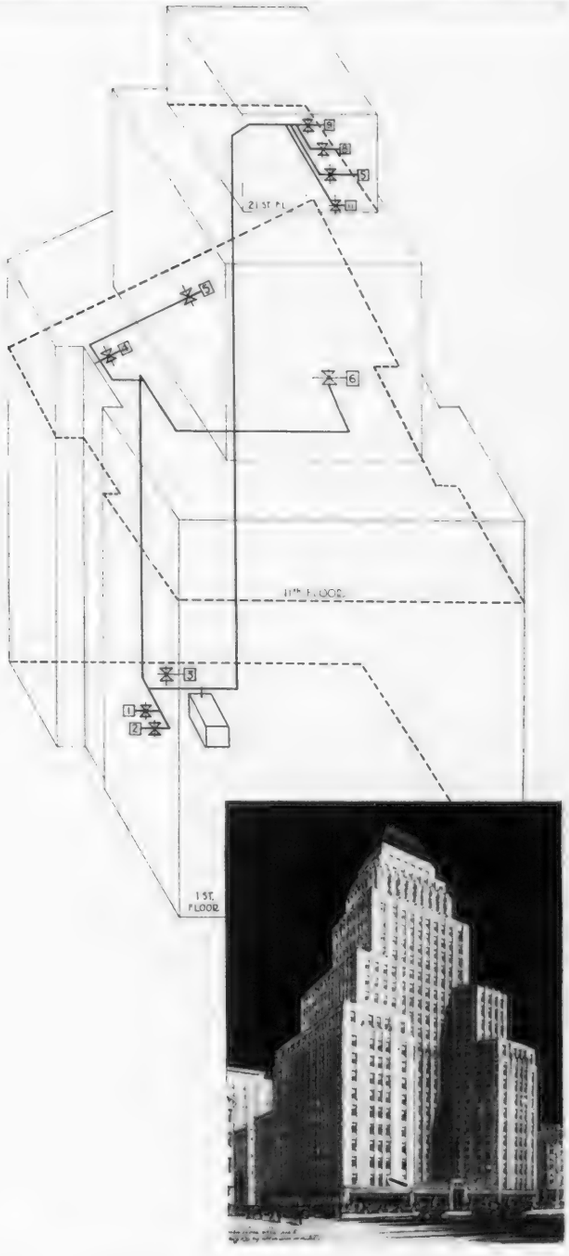
The system checks and provides for quick changes in outside weather and guards against overheating and underheating. Any one of the eleven zones can be changed without interfering in any way with the temperature in the other ten zones.

The system comprises the SIMPLIFIED ORIFICE DISTRIBUTION and accurate electrical METHOD OF CONTROL.

The Tallmadge System is applicable to all plants, both new and existing; a trained corps of heating specialists are available to assist the designing engineer and heating contractor on any installation—this without obligation.

The story of Tallmadge Control Heating Systems has been prepared and will be sent without obligation to heating contractors and others who are interested.

Write us for complete information.




Isometric view of the 11 control zones installed in the United Shoe Machinery Corporation's plant.

Parker, Thomas & Rice
*Architect*

Hollis French and Allen Hubbard
*Engineers*

Geo. A. Fuller Company
*General Contractor*

Cleghorn Company, Boston,
*Heating Contractors*

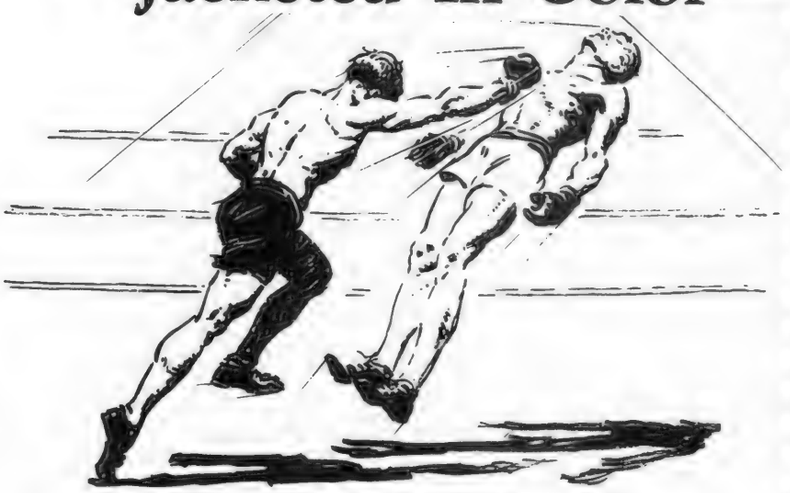
## WEBSTER TALLMADGE & COMPANY, Inc.

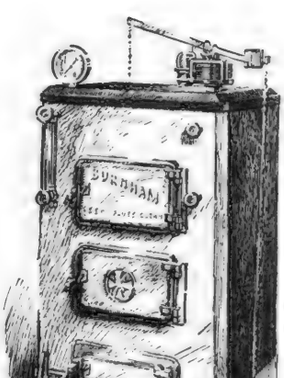
50 Church Street, New York, N. Y.

*It's a Knockout*

# Burnham Boiler

## Jacketed In Color—






SOMEBODY in your town is going to put over a swift one, with Kid Burnham, Jacketed in Color.

Don't get caught with your iron men lined up at the wrong corner of the ring.

For all its smooth beauty, it's one of the most practical home heating boilers made, from both user's and steamfitter's angles. It's a water tube type Burnham, jacketed as you'd expect Burnham to do it.

*Send for interesting particulars and prices.*

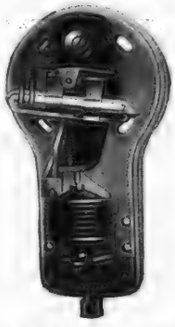
Burnham Boiler Corporation

IRVINGTON, N. Y.

*Representatives in all Principal Cities of the United States and Canada*

# MERCOID CONTROLS

## *A complete line of electrically operated automatic controls for Heating and Ventilating*

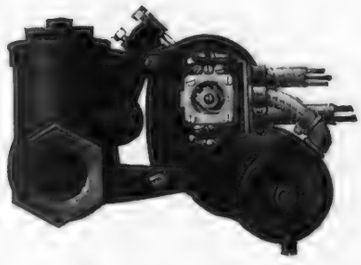


### Mercoid Thermostat No. 845

*Room Temperature Type.* For temperature control on Oil Burning equipment, Unit Heaters, Stokers, Refrigeration and General Industrial work.

The Mercoid 845 offers accurate, dependable control and complete freedom from troublesome servicing. It carries the well-known Mercoid switch, no open arc—no corrosion of contacts. The instrument operates on full line current —110 or 220 volts A. C. or D. C. No intermediate control is necessary.

The 845 Mercoid is especially well fitted for Unit Heater work. Thousands of them are now in operation and accurate regulation maintains an even constant temperature that greatly adds to the comfort and efficiency of factory workers.

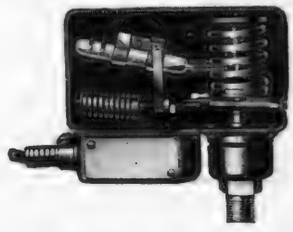


### Arco Motor Valve No. 847

Single seated motor driven valve for high or low pressure steam, water, oil, gas, brine, etc.

This motor valve is being widely used in connection with zone heating and also to automatically regulate the supply of steam for those buildings using central station steam. The valve is opened and closed by a three wire electric circuit controlled automatically by a Mercoid thermostat. Many engineers have found that the accurate regulation furnished by the combination of the motor valve and Mercoid will soon more than pay for the cost of the equipment.

Many building owners will gladly install this automatic control equipment when they are shown how it will effect great savings in fuel and add to the heating comfort in offices or work rooms.



### Mercoid Control No. 848

One of many models in a complete line for the control of temperature from minus 30 degrees to 600 degrees F. and pressure from vacuum to 2500 lbs.

This model Mercoid is widely used for boiler control on Oil Burners, Buckwheat Burners and automatic Stokers. Many thousands of them are now in operation and engineers everywhere are praising their accurate, dependable performance.

This instrument also operates on full line current either 110 or 220 volts. Its construction is rugged and simple—no delicate adjustments. There are no open arcs or corrosion of contacts. Mercoids are free from troublesome servicing.

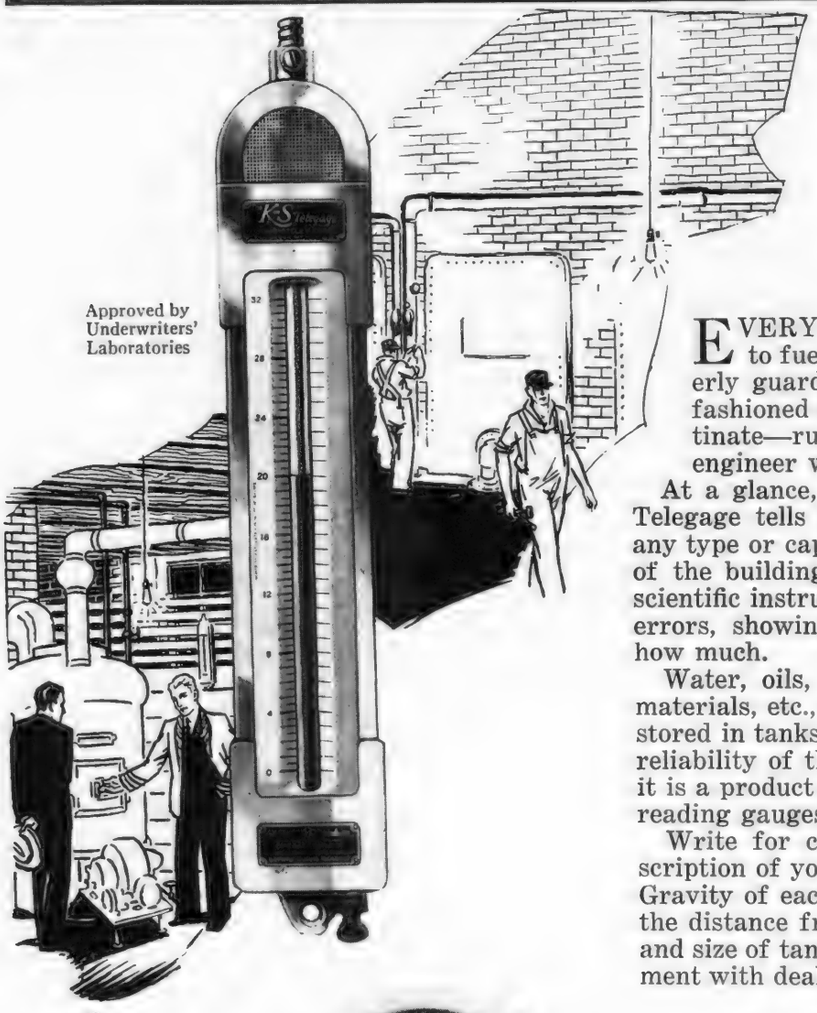
*Every heating engineer should know about the complete line of Mercoid controls. Write today for complete information.*

## AMERICAN RADIATOR COMPANY

Accessories Division, Dept. MHV-2

40 West 40th Street New York, N. Y.

THE HYDROSTATIC DISTANT READING GAUGE




Approved by Underwriters' Laboratories

# A Necessary Part of the Burner Outfit that You Install

EVERY type of oil burner installation is subject to fuel failure unless the storage tank is properly guarded. Burner operators who use an old-fashioned measuring stick are likely to procrastinate—run out of fuel—and blame the heating engineer who installed the outfit.

At a glance, with ease and dependability, the K-S Telegage tells the depth of fuel in storage tanks of any type or capacity. Placed conveniently in any part of the building, at any distance from the tank, this scientific instrument guards the fuel oil supply against errors, showing when a new supply is needed, and how much.

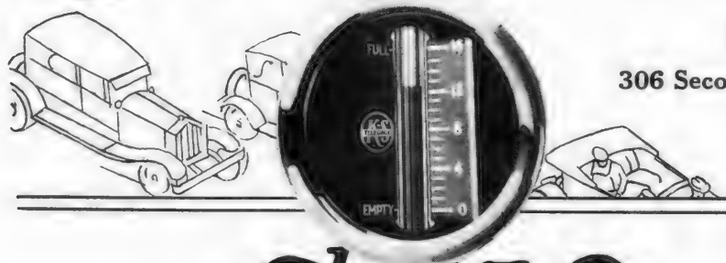
Water, oils, chemicals, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant-reading gauges.

Write for complete information, giving a full description of your requirements—the Baume or Specific Gravity of each fuel or other liquid to be measured—the distance from tank to desired location of gauge—and size of tank. Information concerning our arrangement with dealers sent on request.

**KING-SEELEY CORPORATION**

**306 Second Street** **Ann Arbor, Michigan**

*New York—44 Murray Street*
*Chicago—472 Wrigley Building*




# The K-S Telegage

BE CERTAIN WITH THE *K–S TELEGAGE*

*Standard factory equipment on three-fourths of all cars selling for $700 or more.*

BAD AIR IS BAD BUSINESS

# VENTILATION

## *is Industry's Constant Need*

—AND IT COSTS NO MORE THAN GOOD LIGHTING EQUIPMENT

A workman complains: "It gets worse here every day. This place hasn't had an airing in the last ten years."

"And they expect us to work overtime tonight!" adds his air-starved partner.

"Not for me. Rush job or no rush job, I'm leaving on the dot!"

Good work and bad air just can't get along together in any business . . . in summer or in winter.

Industry's constant need is *fresh air!* Especially where there are "steam" processes or "pickling" vats . . . in machine or forge shops, grinding or welding departments.

Not only are men dissatisfied and uncomfortable in plants where terrific heat, gases and fumes are prevalent, but they get careless in their work. Accidents—illness—all sorts of troubles—come with Bad Air.

Bad Air is bad business, not only in industrial plants, but in offices, stores, restaurants, theatres — wherever people work or meet. Victims of Bad Air are tired, half sick, drowsy, sluggish. They are easy prey for headaches, colds and other more serious respiratory diseases.

Installing American Blower Electric Ventilating Equipment corrects Bad Air conditions at their *source.* Now, when summer heat puts an extra burden on workers, is the time to equip your plant with electric ventilation. Send for our free 40-page illustrated catalog and price book.

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.
*BRANCH OFFICES IN ALL PRINCIPAL CITIES*

(876)

**COUPON**

Please send me, free of charge, your 40-page illustrated catalog and price book.

*Name*_____

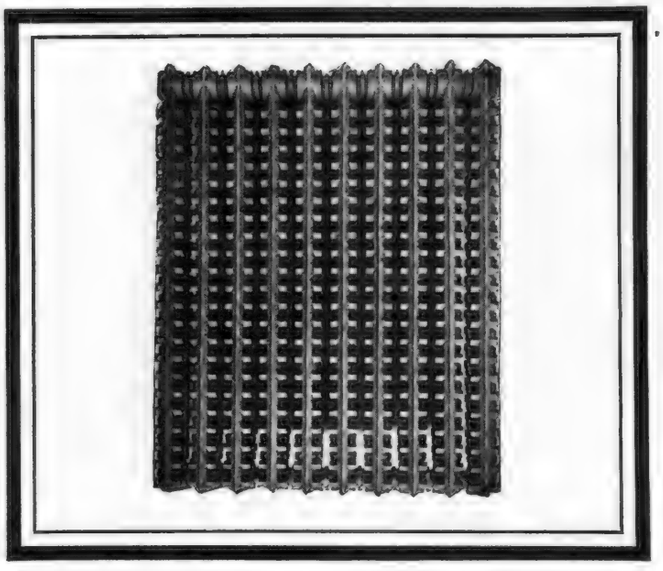
*Full Address*_____

**American Blower**

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

# VENTO
## CAST IRON HEATERS



FOR over 25 years Vento Cast Iron Heaters have been the leading choice of the world's heating and ventilating engineers—and for over 25 years Vento has maintained a perfect record, for there is not one known instance of failure.

There are reasons for Vento's outstanding success. The superior grade of cast iron from which Vento is cast gives this heating surface an unlimited life. It will not rust or laminate under the action of air, gas, water, or summer dampness. The unique design and construction of Vento insures rapid circulation of steam and breaks up air currents so that the entire surface of the Heater gives full heating efficiency.

Write today for engineering data and catalog.

AMERICAN RADIATOR COMPANY

816 So. Michigan Avenue
Chicago

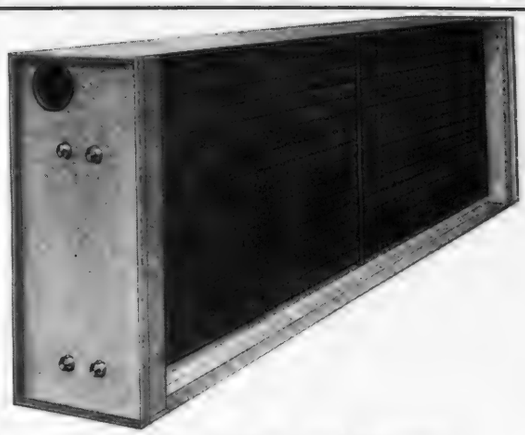
TWO TYPES
HEATING

BRANCHES IN ALL

# ARCOBLAST

## ENCASED SECTIONS

## OF INDIRECT SURFACE



*For Central Fan and Plenum Chamber Work*

THE Arcoblast encased section pictured above is especially designed for central fan and plenum chamber work, and is recommended when building construction will not permit the use of the heavier cast iron Vento surfaces.

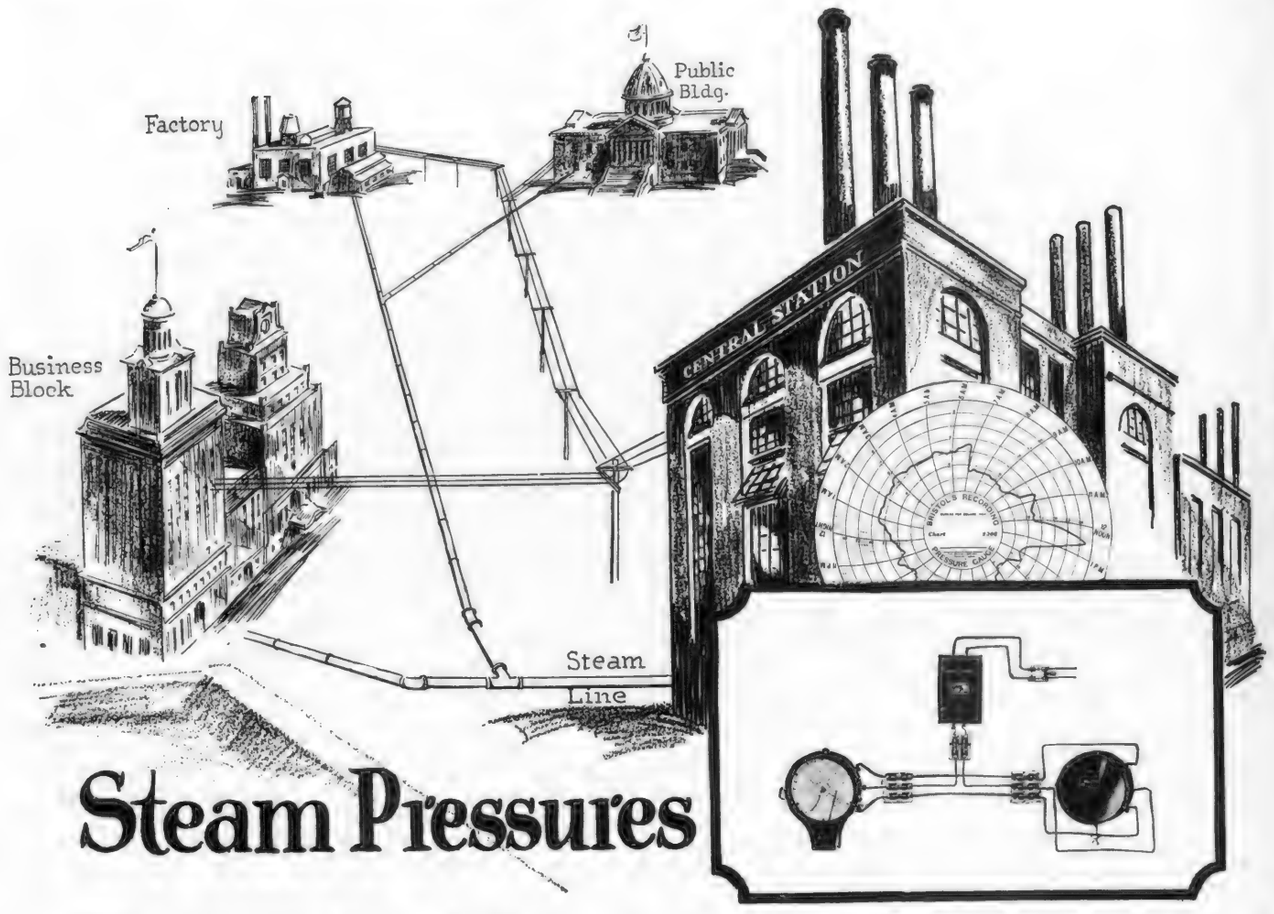
The encased Arcoblast is built on the same engineering principles and design used in the construction of Arcoblast surface for Unit Heaters. Many thousands of these Heaters are now in operation and their performance as well as their endorsement by leading Unit Heater manufacturers offers convincing proof of their success.

Write today for catalog giving complete information and all engineering data.

PRINCIPAL CITIES

AMERICAN RADIATOR COMPANY

40 W. 40th Street
New York




# Steam Pressures

## Thousands of feet away . . . accurately recorded *inside* of central heating plant

Distance cannot impair accuracy. The delivered pressure at each customer's premises can be continuously recorded—without lag—on the boiler room gage board or at any desired point in the central station by means of a

## BRISTOL'S
### Long Distance Transmitting System

Operates on the induction balance principle, without time lag. The transmitting and receiving instruments are electrically connected by three wires to operate at 110 volts a. c. and at all standard cycles. Very little power is consumed, and the instrument requires no more attention in service than a standard Bristol's Recorder.

The system is applicable to transmit records of pressure, vacuum, temperature, water or liquid level, and mechanical motion for any distance from a few feet, up to several miles. When desirable, alarm attachments can be furnished to give immediate warning of abnormal conditions as soon as they arise. These may sound bells or sirens or illuminate signal lights.

In the industrial plant, the system makes centralized systematization of many process operations possible. It saves "time out" by men in making their rounds to take readings in distant parts of the plant.

**The nearest Bristol's sales engineer is ready to give you prompt service in planning the application of a Bristol's Long Distance Transmitting System for your specific needs.**

***Write for copy of new catalog***

BRANCH OFFICES
Boston
Philadelphia
New York
Pittsburgh
Birmingham

# The Bristol Company
**Waterbury, Connecticut**

BRANCH OFFICES
Detroit
Chicago
St. Louis
Denver
San Francisco

# HISTORY

## MERCOID

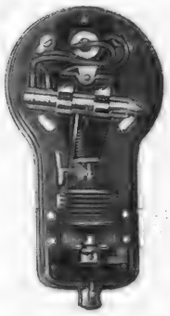
The records of history show Mercoid Controls as pioneers in the oil burner field. Their unfailing performance has placed them in the front rank of dependable automatic control equipment. The Mercoid Corporation does not rest upon its past achievements. New developments are keeping apace with the times and this organization stands ready to cooperate with the oil burner industry in meeting its control requirements.

CONTROLS

SERVICE

### A FEW OF THE MANY TYPES OF MERCOID CONTROLS

*Mercoid Low Water and Pressure Control for the protection of automatically-fired steam boilers, but has various other applications. It prevents firing into dry boilers or building up excess pressure.*



*Mercoid Thermostat for automatic temperature control of oil burners, unit heaters and for other applications where it is desired to control an electric circuit through changes in air temperature.*

*Mercoid Type SM is a complete thermostatic bimetal stack safety control used on burners having either constant ignition, constant gas pilot or where the ignition control is a separate function.*

*Mercoid Automatic Pressure type Boiler control for all steam units.*

*A positive safety limiting device — widely used as a boiler control with automatic oil burners and automatic coal-burning equipment.*

*Mercoid Tipless Tube with guarded lead-in wires is the latest development in mercury tube switches. This new design of Tipless Tube switch is available in various types for many purposes.*

*Mercoid Panel Unit SDP consists of Type S Adjustatherm and Type PI ignition control. Designed to control the ignition period on pressure type burners.*

*Panel Units also available for other applications.*

## THE MERCOID CORPORATION

564 W. ADAMS ST., CHICAGO, ILL. ▼ 25 CHURCH ST., NEW YORK N.Y.

# *Cork* - an Efficient Remedy for Vibration and Noise

ARMSTRONG'S Cork Machinery Isolation provides a vibration absorbing foundation for fans, motors, pumps, and other machinery which greatly reduces the transmission of hum and other disagreeable noises, and lessens the strain on the building structure.

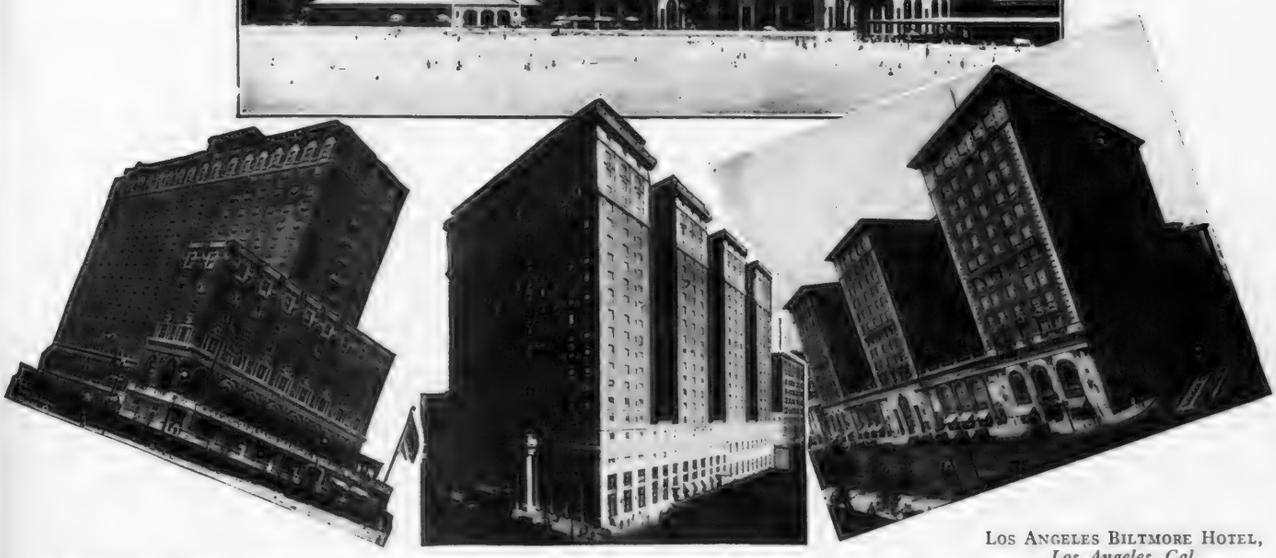
Armstrong's Cork Machinery Isolation is made from clean granules of live cork, compressed in sheets of various thicknesses. It retains its live resilience indefinitely and does not harden or "set."

Being a manufactured product, the density and degree of resilience of Amrstrong's Cork Machinery Isolation can be accurately controlled and, therefore, scientifically adapted to the requirements of any machine, weight, type of motion, etc. Armstrong's is made in three densities—a grade for every need.

Armstrong offices, located in the principal cities, are qualified to give you sound advice on the use of machinery isolation. An inquiry will bring you a sample and full information in a new descriptive folder, and the address of the nearest office. Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Pa.; 1001 McGill Building, Montreal; 11 Brant Street, Toronto, 2.

## *Armstrong's Cork Machinery Isolation*

ROYAL-HAWAIIAN HOTEL,
*Waikiki Beach, Honolulu.*
WARREN & WETMORE, *New York, Architects.*
RALPH E. WOOLLEY, *Honolulu, General Contractor.*



RITZ-CARLTON HOTEL,
*Atlantic City.*
WARREN & WETMORE, *New York, Architects.*
WELLS & NEWTON CO., *New York, Plumbing Contractors.*

HOTEL PENNSYLVANIA, *New York,*
TENNEY & OHMES, *Con. Engineers.*
MCKIM, MEAD & WHITE, *Architects.*
W. G. CORNELL CO., *New York, Plumbing Contractors.*

LOS ANGELES BILTMORE HOTEL,
*Los Angeles, Cal.*
SCHULTZ & WEAVER, *Architects, New York.*
CLYDE PLACE, *Con. Engineer, New York.*
THOS. HAVERTY CO.,
*Plumbing Contractors, San Diego, Cal.*

Almost two generations of service to the owner, architect and contractor.

The result — Whitlock Heaters in prominent buildings from the Atlantic to the Pacific and far out into the Pacific.

In 1891, this Company began the manufacture of heaters—ten years ago the business of I. B. Davis & Sons of Hartford—pioneer manufacturers of closed heaters in this country—was merged with it. The ideals of the two companies were similar —a good product at a fair price—backed up by responsibility and fair dealings.

Thus Whitlock Heaters and I. B. Davis heaters have been generally recognized, by two generations, as representing the highest possible quality in Service water heaters, feed water heaters, hot water converters, condensation coolers, etc.

For this page we have chosen a few hotels, representative of the thousands of Whitlock Heater installations. The service water heating problem in a hotel is probably more important and severe than in any other class of building. The general choice of Whitlock Service Water Heaters for prominent hotels speaks for itself.

# The Whitlock Coil Pipe Company

**40 South Street, HARTFORD, CONN.**

NEW YORK
BOSTON
PHILADELPHIA
CHICAGO
BALTIMORE
DETROIT
SAN FRANCISCO
LOS ANGELES

**and other principal cities. Consult telephone book.**

# To Serve You Better

NOW Time-O-Stat is occupying its new building, which triples the former floor space and permits physical consolidation of the facilities acquired by merger early this year.

This new structure, with all the economies and efficiency it makes possible, is a tangible step forward in our program as announced when the four companies became one. Every user and prospective user of automatic controls can well take an interest in this development, because it gives us unsurpassed facilities from an engineering and manufacturing standpoint.

While this building was being completed, other phases of our activity have shown equal progress. Catalogs covering most of our instruments are now available, incorporating in each case the most recent developments in the field of automatic control. Our distribution system is rapidly covering all the principal cities. Complete stocks are to be carried in each, and intelligent, constructive engineering service will soon be available in these centers.

Let us help you with your control problems. Our long experience and the diversity of the fields we serve, make it possible for us to bring a vast fund of information to your assistance.

## TIME-O-STAT CONTROLS COMPANY

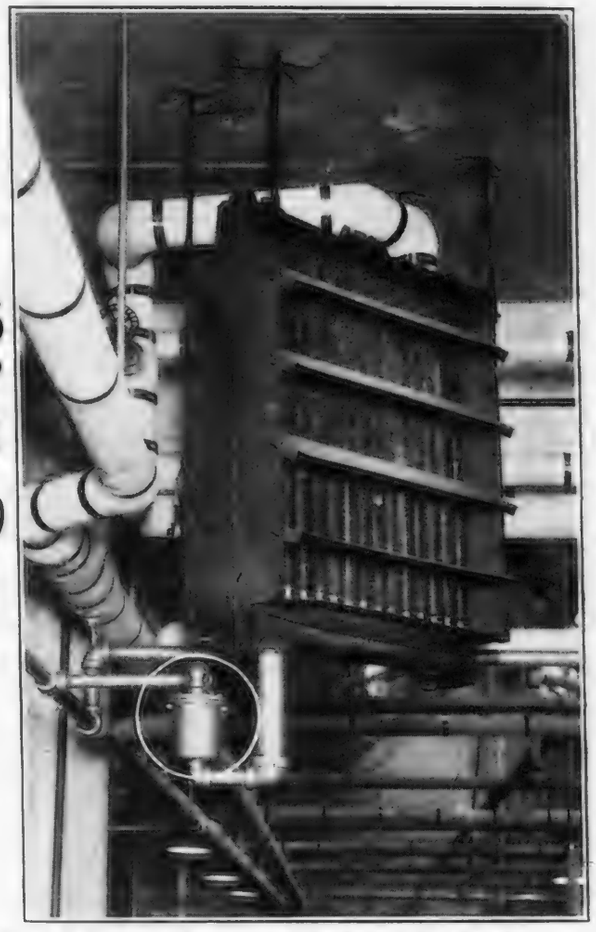
**ELKHART, INDIANA**

*Successor to*

Time-O-Stat Corporation — Leachwood Company
Absolute Con-Tac-Tor Corporation — Cramblet Engineering Corporation

*Manufacturers of* AUTOMATIC CONTROLS *for*

Oil Burners - Gas Burners - Electric Refrigerators - Mechanical Stokers - Furnace Fans
Industrial Ovens - Ice Machines - Unit Heaters - Water Heaters - *Also* Sign Flashers
Mercury Switches - Electric Heaters - Corrugated Metal Bellows



# Keeping unit heaters at maximum efficiency

NO MATTER how good a unit heater is, it cannot work at its highest efficiency when it is impeded by accumulated condensate or air pockets. The illustration shows how this problem has been solved in a large St. Louis laundry—by the use of Armstrong Steam Traps.

*Note the small size of the Armstrong Trap—it is supported by the pipe lines in which it is installed*

Armstrong Traps not only drain condensate as fast as it forms, but also discharge entrained air—automatically—without loss of steam. The swirling, upward motion of the condensate keeps sediment from forming. Oil and scum are driven out.

The simplicity and small size of Armstrong Traps do away with the need for special supports, yet they are rugged enough, in the various types and sizes, to stand pressures up to 900 lbs. and temperatures to 750° F.

ARMSTRONG · TRADE MARK · "INVERTED BUCKET" STEAM TRAP

*We will gladly send catalogs and data for heating system requirements at your request*

ARMSTRONG MACHINE WORKS
346 Maple Street, Three Rivers, Michigan
*District Representatives in 40 Cities*

H & V6-Gray

# Classified Advertising

**Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.**

**HEATING AND VENTILATING — 521 5th Ave., New York City.**

**SALES ENGINEER**—Large eastern utility has a vacancy for a supervisor of sales and service in the use of gas for house heating. Requirements: Graduate Mechanical or Chemical Engineer, 30 to 45 years old, who has had plant and combustion experience and who is familiar with types of heating equipment. Must also have a thorough knowledge of sales promotion and be capable of planning and directing such work. Excellent opportunity for right man. Please state age, education, experience and salary desired at start. Address Box 60, care of Heating and Ventilating.

---

**SALARIED POSITION with an excellent future is open for an experienced Heating Engineer** about 35 years of age with good up and going personality. The man we need is capable of estimating and assisting in other important details, able to contact architects, etc., and have a centered desire to succeed. Liberal connection for the right man. Address letter stating qualifications to Metal Stamping Co., Long Island City, N. Y.

---

**HOUSE HEATING SALESMAN** — Large Eastern utility has vacancy for a man between 30 and 45 years of age for sales work in the use of gas for house heating. Must be a Technical High School graduate and have at least two years' sales experience in residence heating. Permanent position. Please state age, experience, education and salary desired. Address Box 62, care of Heating and Ventilating.

**WANTED**—Unit Heater Salesmen. Manufacturer with national distribution wants additional representation, particularly in Middle West. Real compensation to men who can both figure their jobs as well as sell. Salary —commission. Address Box 63, care of Heating and Ventilating.

---

**MANUFACTURER'S AGENTS** — Something new—VAPOR—VACUUM AIR VALVE. Exclusive territories available to responsible parties. State territory you desire. Address Box 64, care of Heating and Ventilating.

---

**SALES REPRESENTATIVES WANTED** for the Gorton Single Pipe Vapor Heating System, in territories now open. State experience and other lines handled. Communications held confidential. Gorton Heating Corporation, (Manufacturers). Established 1887, 96 Liberty Street, New York.

---

**YOUNG MAN,** age 24, is looking for a position. Finished two-year heating course and have had four years' practical experience. Located in Philadelphia. What have you to offer? Address Box 61, care of Heating and Ventilating.

## BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Summer to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

**Saint Louis Technical Institute**
*Est.* 1910.

The most thorough institution for Technical Home Study to-day.

4543 Clayton Avenue St. Louis, Mo.

## No. 0 THERMOFLEX BLAST AND DRIP TRAP

Especially designed for dripping large supply mains, hot water heaters, unit heaters, etc. A small combination float and thermostatic trap. Self-supporting in the pipe line. Small, compact, and very efficient in operation. Low in cost, high in quality.

*Send for Bulletin No. 52 A.*

**W. D. CASHIN COMPANY**
35 HARTFORD ST., BOSTON, MASS.

## WEIL TYPE "E M" MULTI-STAGE PUMP

Opposed suction eliminates end thrust. Ball bearing—greater efficiency—lower maintenance cost.

Secure Bulletin E-1900.

**Few Agencies Still Open.**

**WEIL PUMP COMPANY**

BILGE-SEWAGE
FIRE-HOUSE
CIRCULATING

BOILER FEED
CONDENSATION
VACUUM

**Manufacturers of Better Centrifugal Pumps**
215-17 W. SUPERIOR ST., CHICAGO

*COAL, properly utilized with modern equipment, is the cheapest, safest and most efficient fuel.*

# Announcing

## *The* GENERAL STOKER

WIDE RANGE OF FEED—VISIBLE CONTROL

PRE-HEATED AIR ZONED & POSITIVELY CONTROLLED

AUXILIARY PRE-HEATED AIR OVER FIRE

PATENTED NON-CLINKERING, SELF-COOLING GRATE BAR

SYNCHRONIZED DAMPER CONTROL

FULLY ENCLOSED FAN COOLED MOTORS

FRANCKE—FLEXIBLE COUPLINGS

S-K-F BALL BEARINGS THROUGHOUT

CUTLER-HAMMER CONTROLS

TORK CLOCKS

FIRE-BREAKING ELIMINATED

CLEANING SIMPLIFIED & MADE EASY

COAL METER

**Type "C"**
FOR BOILERS OF
**25-50 H.P.**

**Type "D"**
FOR BOILERS OF
**50-75 H.P.**

**Type "E"**
FOR BOILERS OF
**75-125 H.P.**

**Type "F"**
FOR BOILERS OF
**150-250 H.P.**

*Write for Particulars*

The proven features of economy, efficiency and convenience of underfeed stoking have been brought to new standards in the

## GENERAL STOKER

Its sensational performance and outstanding superiority are due to a host of noteworthy improvements to be found only in the **GENERAL** and at prices substantially the lowest.

## GENERAL STOKER CORPORATION

**270 LAFAYETTE STREET**
**NEW YORK**

*The front cover of the first issue of H & V.*

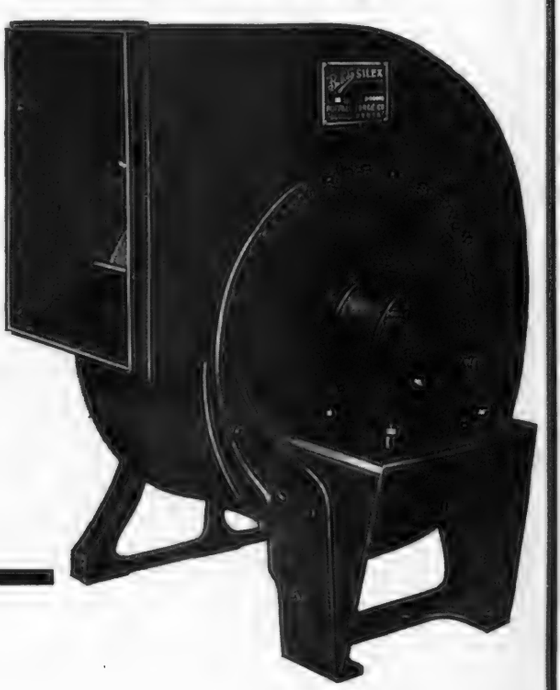
# Still "Setting the Pace"

Away back in 1904, the Buffalo Forge Company was specializing in heating and ventilating. Since then, consistent engineering and a liberal policy have produced many changes in practice in the heating and ventilating field.

# "Buffalo" —Today—

Among our latest developments is the new Buffalo "Silex"—the Quiet Ventilating Fan, which we are offering in the smaller sizes in standardized units—a departure from ordinary practice which will result in lower prices, quicker deliveries, better fans and fewer chances for error in layouts of ventilating systems.

If you are not acquainted with Buffalo "Silex" fans, write for data today.



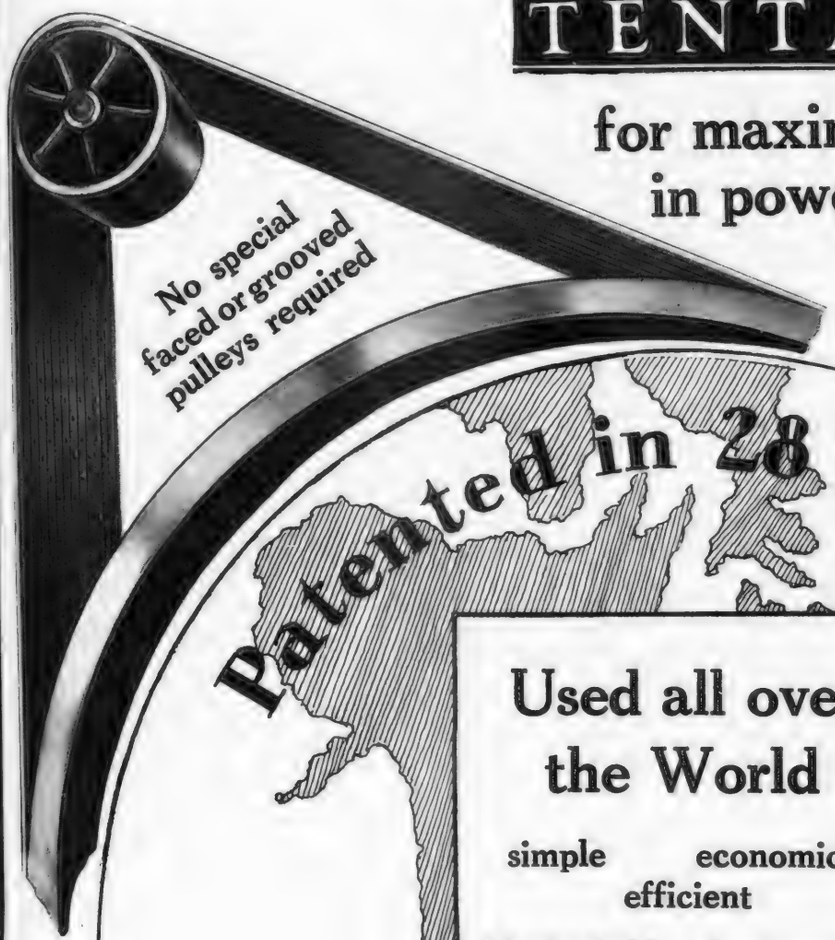

## Buffalo Forge Company

**480 Broadway, Buffalo, N. Y.**

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

# TENTACULAR

## for maximum efficiency in power transmission




Patented in 28 Countries

**Used all over the World**

simple economical efficient

Unrivaled for short centers and high pulley ratios

If you want the best—specify TENTACULAR

TENTACULAR

Alexander Brothers Inc.

General Office and Plant: 19 South St., Phila., Pa.

*Branches*
CHARLOTTE, N. C.
302 East Sixth Street

ATLANTA, GA.
291 Garnett Street, S.W.

*Distributors in all Principal Cities*

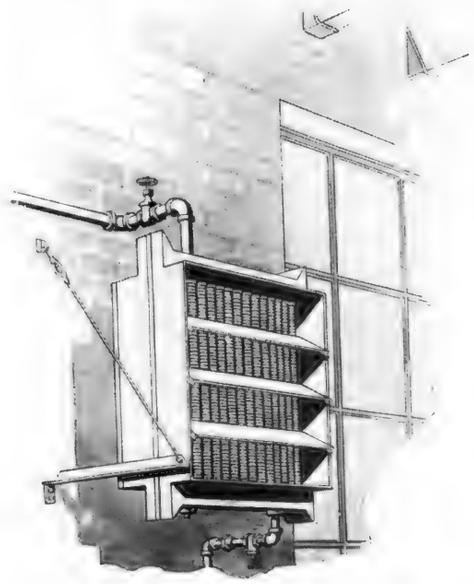
*Branches*
NEW YORK CITY, N. Y.
30 Church Street

CHICAGO, ILL.
162-166 N. Clinton Street

# GREATER HEATING EFFICIENCY

For small as well as large space

# TWINFAN
## UNIT HEATERS



### The New Type V

The Type "V" Heater gives to the smallest shop the same high standard of heating efficiency formerly enjoyed by only the largest and more pretentious shops, warehouses, garages, etc.

Wherever there are spaces to be heated in either large or small rooms of any description, Twinfan Unit Heaters will do it more efficiently.

Other Twinfan Types—
Type A—either floor or suspended installation. For heating very large areas.

Type D—either floor or suspended installation. For heating somewhat smaller areas.

Type F — Particularly adapted to large multi-story industrial plants for ceiling suspension.

### The Dwyer Twinfan Radiator

The lightest weight, practical copper radiators. All joints between coil pipes and headers are patented *screwed ground joints*—no soldering—no brazing.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH TWINFAN UNIT HEATERS



# "Useful" Heated Air

A greater volume of "useful" heated air in the working zone is assured through the use of Young Unit Heaters. In addition, sturdier construction with less weight, quiet operation, less vibration and consequent longer life.

Young Unit Heaters embody the experience of nineteen years of specialization in the design and construction of heat transfer equipment. This is reflected in the important exclusive features which give this unit its high and constant efficiency. Send for Bulletin H-429 for full details.

# Young Unit Heaters

YOUNG RADIATOR COMPANY
*Heating Division*
RACINE WISCONSIN
*Representatives in Principal Cities*
Correspondence Invited on Open Territories

Young Quality

© Y. R. Co. Reg. U. S. Pat. Off.

BUILT FOR ENDURANCE AND MAXIMUM PERFORMANCE

THE WORLD'S LARGEST RADIO PLANT

## ATWATER KENT MANUFACTURING CO.

Philadelphia

THE BALLINGER COMPANY, ARCHITECTS & ENGINEERS, PHILADELPHIA AND NEW YORK

OLD PLANT
14 ACRES
UNDER
ONE ROOF

NEW PLANT
16 ACRES
UNDER
ONE ROOF

BOTH
HEATED
BY
YORK
HEAT-DIFFUSING
UNITS

## YORK HEATING & VENTILATING CORPORATION

YORK HEAT-DIFFUSING UNIT

PHILADELPHIA

YORK HEAT-DIFFUSING UNIT

# The Final Chapter in the History of Heating

5,000,000 Cubic Feet

of space heated without a smokestack and no floor space used

NO Boiler Room, Boilers, Coal Storage, Stokers, Radiators, Ashes, Grit or Dirt, Smoke or Soot, or Licensed Firemen

100% Automatic Control with

## "STERLING"

DIRECT GAS-FIRED **Unit Heaters**

With a considerable saving in first cost, operation and maintenance over all other methods of heating. They deliver the heat where you want it,—when you want it without waste or worry, and no firemen or engineers are necessary.

Take the time to investigate! Facts will convince you. Write, telephone, or call.

**TEXO SALES COMPANY, Inc.**

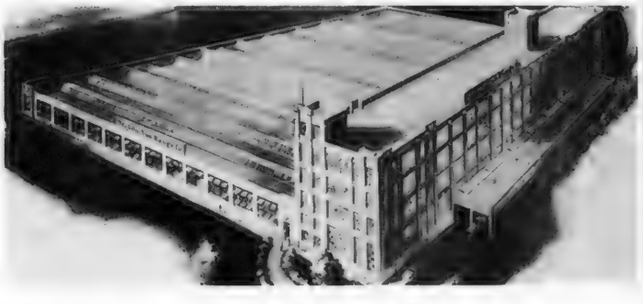
*Originators of the Gas-fired Unit Heater*

MANUFACTURERS

Heating and Ventilating Equipment

CINCINNATI, OHIO

*Below:—The John Van Range Company, Cincinnati, the largest Gas Heating Plant in the World. 54 Sterling Units Used.*



The

THERMO SYPHON TRAP

## —leaves silence on the job as well as safety

WHEN the heating system goes into operation, it is a comfort to building owner, manager and occupant alike to know that noiseless operation is assured by a THERMO SYPHON TRAP.

Maintenance of water level, too, by these dependable devices is "Life Extension" for boilers, on all vapor, vacuum, atmospheric, and modulation systems .... on one or two pipe steam systems from less than atmospheric up to twenty pounds pressure.

*Send for Bulletin No. 16-HV giving full details. We solicit correspondence on heating difficulties.*

**HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.**

LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA

# Leading Universities

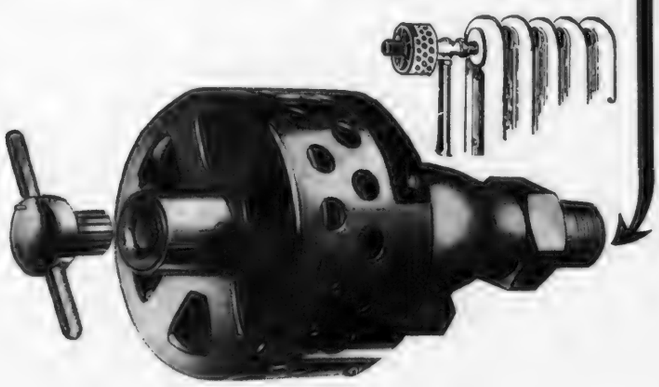
## have Tested, Endorsed and Installed

Sterlco TRADE MARK

## ROYS THERMOTROLS

*Photo No. 1. Engineering Bldg. of Univ. of Oklahoma. Photo No. 2. Law Building of Univ. of Minnesota. Photo No. 3. Laboratory of Anatomy and Physiological Chemistry Bldg. of Univ of Pennsylvania. Photo No. 4. Physics Building of Univ. of Minnesota. Photo No. 5. Infirmary of Univ. of Oklahoma.*

Sterlco-Roys Thermotrols are Self-Contained, automatic temperature regulators that do not require compressed air apparatus or electrical conditions to operate them. They are attached to a radiator just like an ordinary radiator valve. They keep down fuel costs by reducing the flow of steam to the radiator when the desired room temperature has been reached.

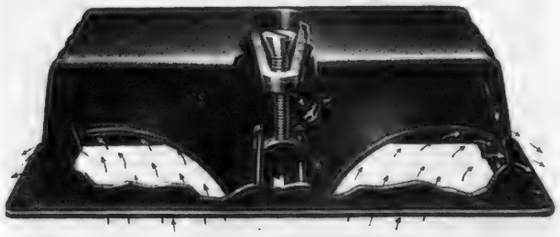


*Write for Bulletin No. 44*

STERLING ENGINEERING CO.
1626 Holton St. Milwaukee, Wis.

**Branch Offices Located in All Principal Cities**

# SUCCESS



Patented

Architects and engineers have instantly seen and recognized the merits of the ENFLO. Although it has been on the market for a comparatively short time, its sturdy and scientific construction has won it many enthusiastic friends.

To those unacquainted with the ENFLO we point to the following features:

1. Made entirely of cast iron.
2. One concealed screw operates both dampers.
3. Curved dampers diffuse air along floor line parallel to rows of seats, eliminating annoyance to those in the immediate vicinity.
4. Inexpensive and economical to install on any type of floor.

**VENTILATING PRODUCTS CO.**
**2800 Cottage Grove Ave., Chicago, Ill.**

H&V3-Gray

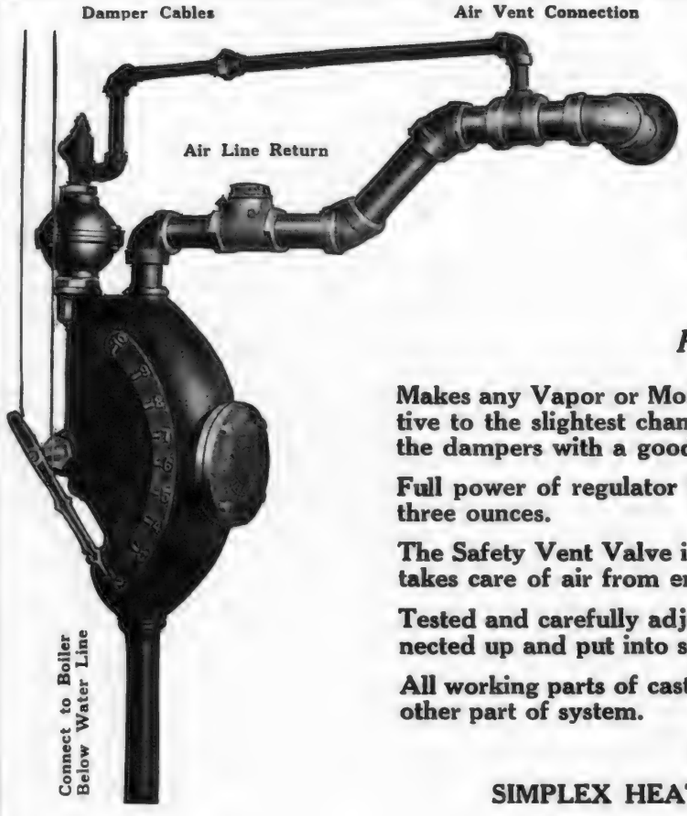
# The TooPas Air Filter
## *cleans the air twice*

BASED on the time tested principles of the Phoenix filter, the new TooPas insures high cleaning efficiency and the elimination of oil entrainment. Sectional construction fits any wall opening. *Send for the Bulletin.*

NATIONAL AIR FILTER COMPANY

*5130 Ravenswood Ave., Chicago, Ill.*

# CONSULT PAGES
# 230, 232, 234, 236
## *Engineers' Specification Index*




# Safety-Vent Vapor Regulator

***POWER IS ITS MIDDLE NAME***

**Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.**

**Full power of regulator is exerted within a pressure range of two or three ounces.**

**The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.**

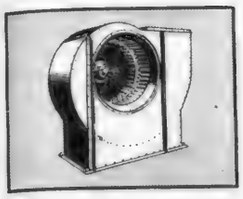
**Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.**

**All working parts of cast bronze. Will last as long as the boiler, or any other part of system.**

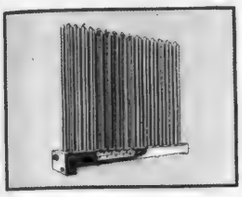
***Write for details***

**SIMPLEX HEATING SPECIALTY COMPANY, Inc.**
**LYNCHBURG, VA.**

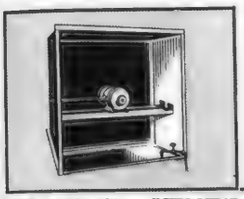
FANS



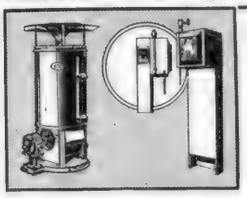
HEATERS



AIR WASHERS



UNIT HEATERS



# Bayley has scored again with...

# CHINOOKFIN HEATER

**HEATING — VENTILATING — AIR CONDITIONING — PROCESS DRYING — MECHANICAL DRAFT — EXHAUST**

THE Bayley Chinookfin Heater has leapt into immediate popular favor. Its remarkable features have won it merited recognition:

A copper indirect radiator as safe for tempering coil service as for reheating.

Built on the famous Bayley Chinook principle—a single header divided into steam and return chambers—an individual radiating tube with individual feed through individual circulating pipes.

Design and construction permits of continuous cycles of expansion and contraction without crystallization of material and resulting damage.

Will not freeze when used as a tempering coil with automatic control.

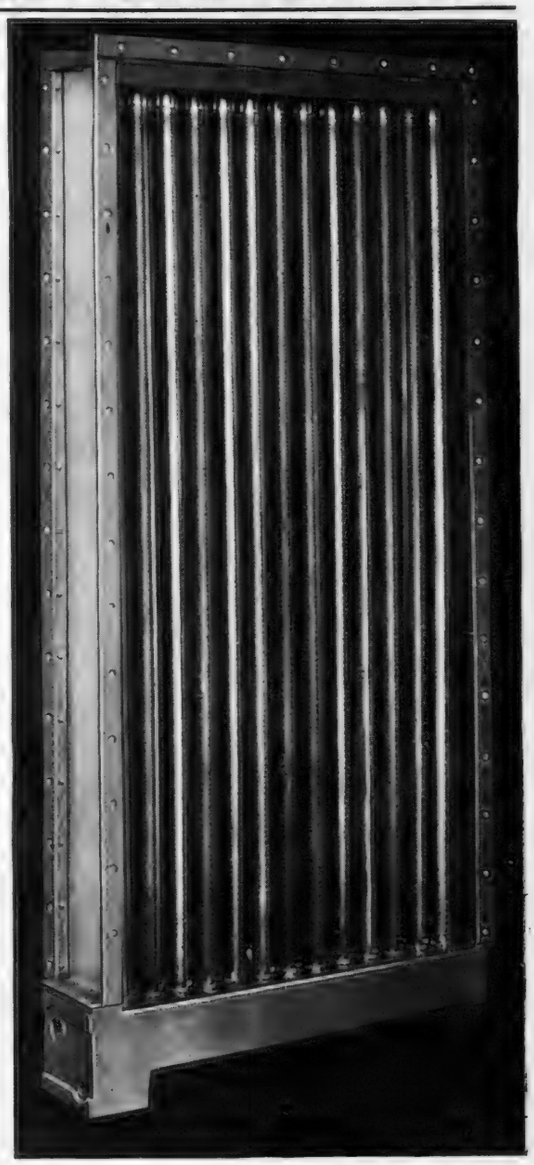
A single faulty pipe does not require a whole new section since the defective member can individually be replaced by quick and simple procedure.

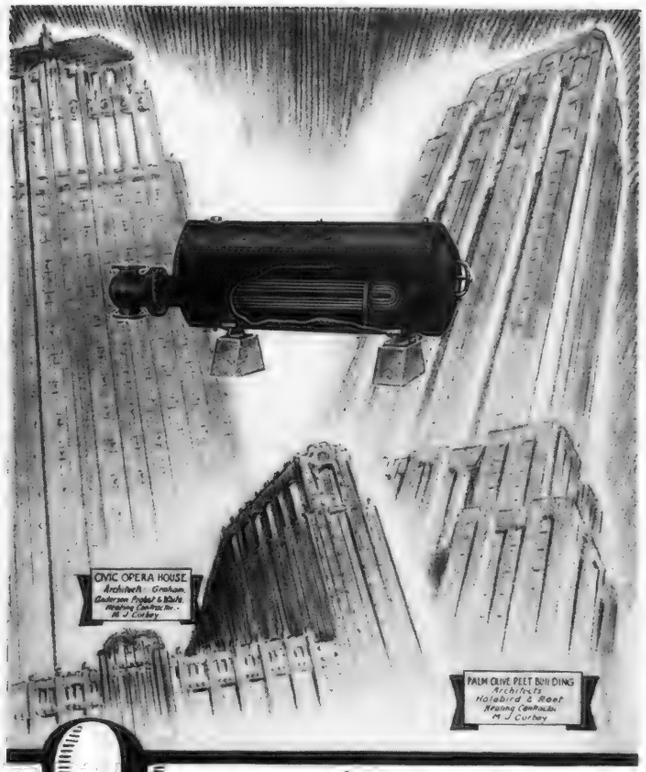
*Write for bulletin describing the Bayley Chinookfin Heater in detail.*

BAYLEY BLOWER CO.
742 Greenbush St., Milwaukee, Wis.

Bayley

*Established 1883*






2 more important CHICAGO INSTALLATIONS by

O. E. FRANK

No matter how frequently tenants in the new Palmolive-Peet Building, or in the new Chicago Civic Opera Building, open the taps for hot water, the water will come through—*hot*. The performance of Frank Heaters is well known in the Windy City. If you were to step into the basements of the Foreman National Bank Building, the State Bank of Chicago, practically any of Chicago's wonderful schools, the International Harvester Company, any of scores of places, you would find Frank Heaters responsible for water heating jobs. Chicago chooses them for dependable service—in difficult service.

**O. E. FRANK HEATER & ENGINEERING COMPANY**
**20 Milburn St. BUFFALO, N. Y.**

# CONTROL HEAT
## With New Adjustable Varying Speed Motor

**A TURN of the switch on the Baldor Controller Box regulates the Variable Speed Baldor Motor to 40%, 60%, 80% or maximum speed. Thus heat from unit heaters so equipped is more quickly and easily controlled than with any other equipment . . . . ball bearings . . . quiet . . . compact . . . . high efficiency . . . high power factor . . . low starting current . . . . low running current . . . low temperature rise . . . no brushes . . . no centrifugal switch. What this new motor has done for the unit heating industry reads like a romance. Get Bulletin. The Baldor Electric Company, 4356 Duncan Ave. . . St. Louis, Mo.**

*and now*—A PACKLESS HOT WATER VALVE

# ARCO PACKLESS No. 901

*the only hot water valve made that combines*
*These Three Vital Features*

**PACKLESS**

The same successful leak-proof packless construction used in other Arco valves —does away forever with the needless expense and trouble of repacking.

**EQUALIZING**

Adjustable stop—permits perfect balance of circulation—permanently set after installation—saves expense of piping changes.

**SWINGING PLATE**

Well-known ARCO Swinging Plate—minimum contact surface prevents sticking —concave plate reduces friction—insures full circulation.

The new 901 is the latest addition to the famous No. 999 series which is rapidly replacing packed valves. Heating contractors everywhere are realizing the importance of the packless feature and are now selling Arco Packless Valves on every job—large or small. Customers gladly pay the small difference for guaranteed Arco quality—protection against leaks and relief from repacking.

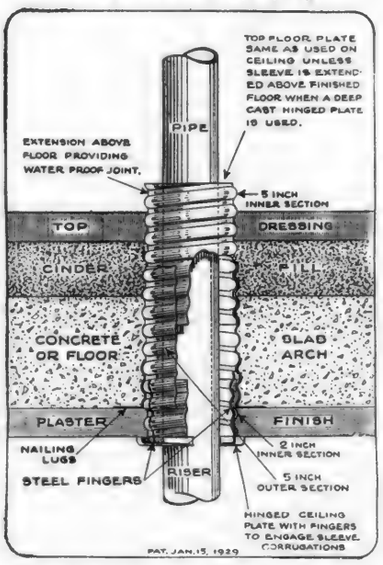
## AMERICAN RADIATOR COMPANY

*Makers of a complete line of quality Heating Accessories*

IN-AIRID · AIRID · VAC AIRID AIR VALVES · MERCOID CONTROLS · ARCO DAMPER REGULATORS · ARCO TANK REGULATORS

# SUPER SLEEVE . . **Unique,** *because adjusted as the job progresses*

PAT. JAN. 15, 1929

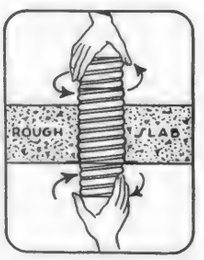


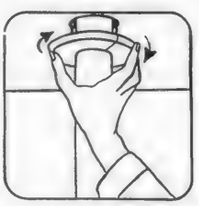

SUPER-SLEEVE is a standard extensible galvanized Iron Pipe Sleeve for all types of building and all sizes of pipe. Adjustable for each stage of construction. Most economical to use.

## *Eliminates "Clipping" and "After-patching"*

The SUPER-SLEEVE is the only pipe sleeve which is light and easy to handle and yet strong enough because of its corrugations to withstand the customary usage during building construction; will remain in place as set; is waterproof and protects the pipe from corroding by preventing contact with concrete, cinder fill and cement; also prevents cracked and spawled plaster at pipes. No "cutting away" of cement or plaster required, nor collection of dirt in sleeves during construction.

*Send for descriptive folder*



KNOWLES PIPE SLEEVE COMPANY, 202 Franklin St., N. Y. City

## DICKINSON
**ALL-CAST-IRON**
## EXHAUST HEAD

Oil and water content of the exhaust steam escaping and falling upon the roof brings about a condition of decay and disintegration.

Dickinson Exhaust Heads prevent this condition, and being made of cast iron, will last as long as the building. This overcomes necessity of constant replacements.

**ÆOLUS DICKINSON**
**3336-44 So. Artesian Ave. CHICAGO**
***(Some territory open for agents)***

## ROSS
**Crosshead-GUIDED Expansion Joint Excels in**

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

**ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.**
New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

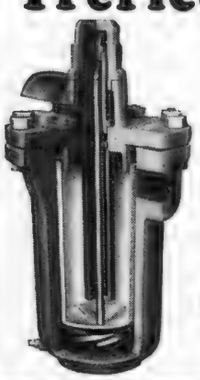
Do you know ?

Every Heating and Ventilating Engineer is entitled to a copy of this Atlas Junior Catalog No. 21? Want a copy?

☐ Reducing Valves ☐ Float Valves
☐ Temperature Regulators ☐ Swing Joint Fittings
☐ Bronze Unions
☐ Damper Regulators ☐ Thermostats
☐ Pump Governors ☐ Balanced Valves

**ATLAS VALVE COMPANY**
REGULATING VALVES FOR EVERY SERVICE
**281 South Street, Newark, N. J.**

## Trerice Steam Trap



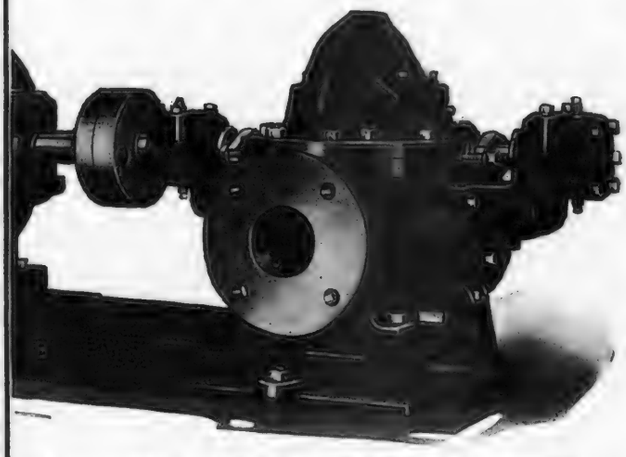
The trap that lasts longer because of the ROTATING VALVE

We will send prepaid to any reputable organization a TRERICE TRAP for 90-day *free test.*

**Write for Particulars**

**H. O. TRERICE COMPANY**
**1338 West Lafayette Blvd.**
**Detroit, Michigan**

# Pumping practices have changed



A Class "SW" high speed, high efficiency ball bearing pump.

MANY engineers can remember the "good old days" when "pumps were pumps," and efficiencies were something to talk about but not to test.

Those days are gone forever! Pump manufacturers know that the modern engineer expects to get what he is promised in the way of efficiency, capacity, head and service and they are bending their efforts in this direction.

It is gratifying to us to know that Buffalo pumps are so well meeting these more stringent requirements that each year shows a substantial increase in volume.

Another trend of importance is toward special pumps for special jobs and there again Buffalo developments have placed us well in the lead.

From an engineering standpoint, the Buffalo organization is in a better position to serve than ever before. Why not make use of our experience?

***There is a Buffalo pump for every purpose. Users testify to their long life and unfailing reliability. Why not ask for our complete binder for your files.***

## Buffalo Steam Pump Co.

**148 Mortimer St.** **Buffalo, N. Y.**

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

# What Every Hot Water System Should Have—

## A HYDROLATOR

The modern hot water system . . . either for heating or domestic supply . . . is HYDROLATOR - equipped. Heating contractors, architects and engineers are rapidly learning that the HYDROLATOR should be just as standard a piece of equipment on a hot water job as a boiler.

### Stimulates Circulation

The HYDROLATOR draws the water through the system many times faster than ordinary thermal flow. There is no such thing as a "sluggish" HYDROLATOR job.

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Every radiator gets an even amount of heat —no "orphan" radiators out in the end of a line.

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The HYDROLATOR increases the efficiency of the entire system — thus fuel costs *must* come down, and by a substantial margin.

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*Distributors in Leading Cities*

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**HYDROLATOR**
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**Whenever you have a specific ventilation problem, send it to our engineering service department. This consulting and advisory service is free to Emerson contractors. Its purpose is to help you make sales by helping you to recommend the most satisfactory installation for any particular requirement.**

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**This attractive leaflet will be supplied free in liberal quantities to Emerson contractors. Use as an inclosure for your regular mailings. It will build up exhaust and ventilation fan prospects for you at no expense.**

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12-16-18-24-30-36 inch sizes.
*Made by the makers of* Emerson 1/30 to 2 H. P. Motors. A.C. and D.C.

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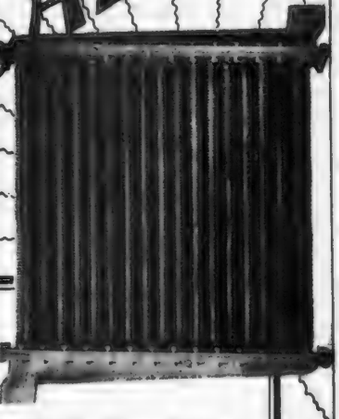

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### Sturdy Non-Corrosive Highly Efficient Low Air Resistance Type

A seamless Copper Tube Heater of great efficiency for all forced air heating systems. Thousands of installations are giving unequalled service.

Helicalfin Tubes are equipped with flat copper radiating fins. There are no corrugations to catch the dirt. We supply a size of Helicalfin Tube for every type of heat transfer equipment.

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ROME, N. Y.
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Mr. Conrad Faber, General Manager of the Parkshore Apartments of Chicago, writes—"The three FIRE-KING Automatic Coal Burners installed in the Flamingo and Parkshore apartments showed us a net saving of $5,275.77 from the cost of oil for the first six months of operation."

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Send today for Bulletin "H" giving complete information on this dependable underfeed stoker—let us show you how it is solving the power and heating problem.

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## *for*
## All Heating Boilers

**There is a type and size of METAPHRAM Damper Regulator to meet every heating boiler requirement.**

The Type "F", with 2″ Metaphram Expansion Wafers is a thermostatic regulator for hot water boilers and domestic water heaters.

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In between are the Types AA and A-2 for small, low pressure boilers; the Type B-2 and C-2 for boilers larger in size, requiring increased power to properly regulate draft and control combustion.

All Metaphram Regulators are extremely sensitive and powerful. New features recently incorporated in their design have increased their effectiveness greatly. The Type F works on changes as low as 5° in temperature; the pressure regulators on changes as low as 1 oz.

Not only is the Metaphram line complete to meet all damper requirements, but Metaphram Regulators are so practical in design and rugged in construction that they will work to the satisfaction of the heating plant operator under the most adverse conditions.

If you don't know the Metaphram line, clip the coupon, or write for copies of latest bulletins.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

NATIONAL REGULATOR CO.
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Please send us
☐Bulletin F-100—Type F Metaphram Damper Regulator for hot water boilers.
☐Bulletin LP-100—Metaphram Damper Regulators for low pressure boilers.

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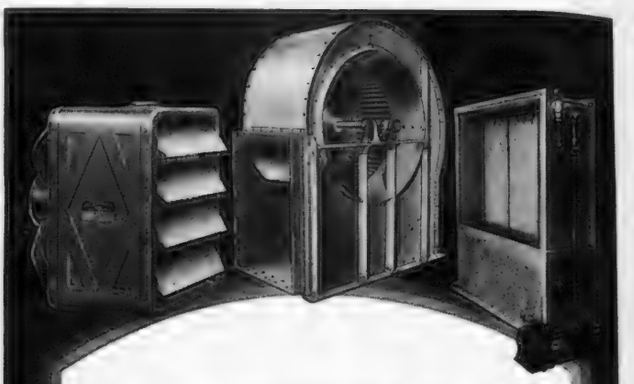


The refinements and developments suggested by more than forty years of engineering and manufacturing experience are reflected in New York Blower products.

*Write for Bulletins to*
*3151 Shields Avenue*
*Chicago, Ill.*

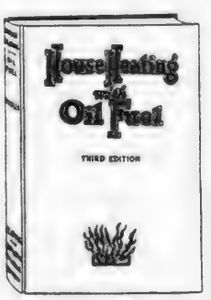
The NEW YORK BLOWER COMPANY



# House Heating with Fuel Oil

By P. E. FANSLER,
*Associate Editor, The Heating and Ventilating Magazine*

*A representative of one of the largest oil burner manufacturers writes us:*




"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

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The NEW 1929 MODEL

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The Latest Development in Oil Burning Boilers!

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Our own inspectors are so much more exacting on their specialty—than any general inspector ever is—that you can omit this operation in your plant.

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## and what it means in dollars and cents to You!

THE quarter century just passed has vastly altered our former estimates of an adequate standard of living. The up-to-date home of today is certainly a big improvement over the mansions of "gay nineties."

Modern business, accustomed to initiate drastic changes, is in a mood favorable to far reaching projects of reconstruction and if the inspiring new architecture that is flowering in our commercial structures is to have its counterpart in our dwellings, an added stimulus is assured in the building of middle-class and upper-class homes.

The new building era at hand will bring forth more astonishing transformations than the last and into such an era of transformation, the Bryan Boiler fits admirably. New! Automatic Heat! Absolutely Modern! Economical! Efficient! . . . The Bryan Boiler offers the alert dealer an additional opportunity to cash in on the present trend of home building.

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Bryan Boilers are built *specifically* for use with oil and gas burners.

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# COMPLETE

Swartwout offers a complete line of efficient steam products. Ask for complete catalog.

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# Controlled Heat and Ventilation

are only possible when winds are unable to penetrate and influence interior heating and ventilating air currents.

ATHEY Weatherstrips, after severe tests by disinterested engineers, have shown four times the efficiency of the best of other much exploited devices. It is the only Athey cloth-lined metal weatherstrip made and is fully guaranteed against moths, decay or pull-out, and will last during the life of the building.

Four times actual size.

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**Cloth-Lined Metal Weatherstrips**

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The best Heating Engineers plan for sufficient heat with a minimum fuel consumption by Atheyizing all windows of wood or steel.

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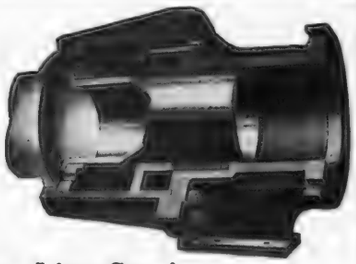
HOWARD
Guided
Expansion
Joint



**For Pipe Line Service**

Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

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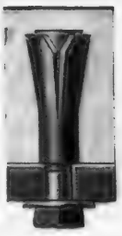
**Self-Drilling Expansion Shells**

Every shell makes its own hole. Used in ceilings, walls, floors and beams for fastening pipe hangers, etc., and for bolting timber and other equipment to concrete and stone. Internal U. S. Standard Threads for rods, bolts and screws.

Quickly installed by hand or with PHILLIPS SPRING HAMMER. No DRILLS required.



*Write for full details*

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**Accurate Regulation**

**Assured with Kieley & Mueller Regulating Valves**

For a period of 50 years Kieley Pressure Regulating Valves have maintained a prominent place in the Power Plant and Heating Field. Their remarkable simplicity of design and rugged construction have helped to maintain this predominance.

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*Service* The *Satisfaction*

VECO SYSTEM of VAPOR HEATING

**Write us about the Building you want to heat—any building, regardless of size, character or location. VECO gives the same good service wherever installed.**
**— WE GUARANTEE IT —**

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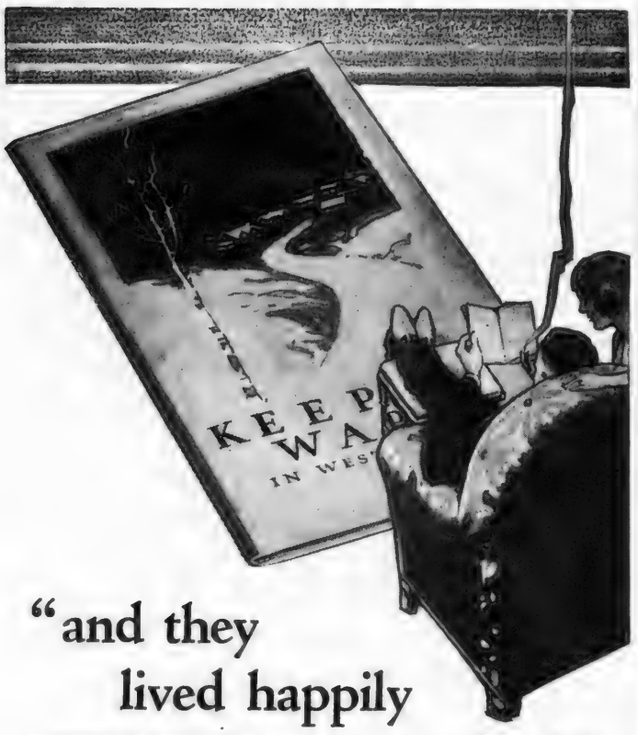

# "and they lived happily ever after!"

*A story with a happy ending for your Newport customers*

They say an author's as proud of his work as a mother is of her youngest child. That's why we're sticking out our chest—we've just published a 24 page book.

It's called "Keeping Warm in Weston Park" and it's all about the adventure of a young couple in heating their suburban home. The happy climax comes where our hero and heroine decide to install a Newport Magazine-feed Boiler.

This book is designed for easy reading by homeowners—planned to interest them and plant in their minds the desire for a better heating plant. A brief description of the Newport magazine-feed design, with its convenience and fuel-saving features, is included with the story and we are sure the entire book will work to the advantage of heating men who sell and install Newports. It's being advertised in general magazines of wide circulation and is sure to bring in many inquiries.

Would you like a few of these books to give to good prospects? If so, we can supply them. Use the coupon below, but hurry, for the edition is limited.

NEWPORT BOILER COMPANY
529 S. Franklin St., Chicago

THIS diagram shows the unique magazine-feed principle of the Newport Boiler. You fill the magazine never more than once a day . . . usually two or three times a week, as the weather requires. As the fuel burns away at the bottom gravity feeds more coal from above. An even fire-bed is maintained.

*Successful heating for 15 years. Thousands of satisfactory installations have proven the soundness of Newport-magazine feed-heating.*

*A size for every need, Bungalows, Homes, Apartments and other buildings. Steam, Vapor or Hot Water systems.*

Fill in your name and address and return this coupon

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Name.....

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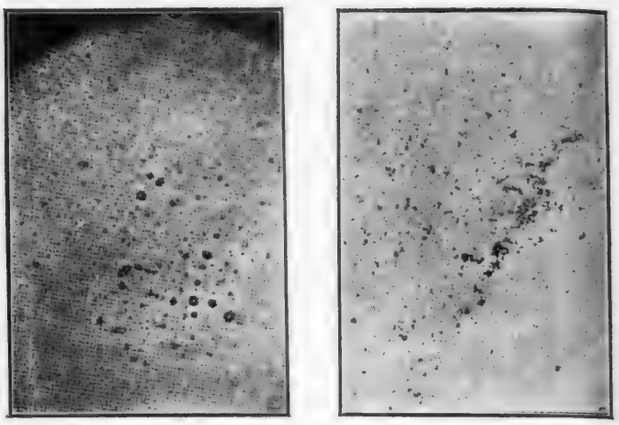
BOILERS

*Distributors in all Principal Cities U. S. and Canada*



# THE DUST MENACE

## . . . How to Combat It

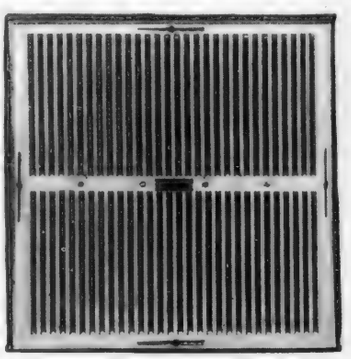


*These Microphotographs Show Relative Number of Dust Particles in the Atmosphere of (left) Boston and (right) St. Louis.*

The Research Committee of the A.S.H. & V.E.—realizing the dangers of the pollution of air as pointed out in tests compiled by H. C. Murphy—has arranged to cooperate with Dr. C. F. Marvin, Chief of U. S. Weather Bureau, in dust tests in various cities. These tests showed 17,600 particles of dust per cu. ft. of air in St. Louis, which means that the average resident is inhaling in excess of a tablespoonful of dirt and soot every 24 hours.

The relation of these figures to the spread of disease is demonstrated by a test made in the Boston City Hospital. This showed nearly 450 living bacteria in 10 liters of air.

In addition to the danger to health, dust ruins the interiors and furnishings of buildings and adds thousands of dollars to annual cleaning and decorating bills.



By installing Protectomotor Panel Air Filters, 99 9/10% of the dust and soot can be removed from air before it enters buildings. The initial cost is low and maintenance nil, for no oil drains or cleaning tanks are required.

These filters operate from 2 to 6 months without cleaning, and it takes but a half minute per panel to remove all accumulations with our vacuum cleaner.

*Send for a copy of our Catalog.*

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Perfect Positive Protection

**PANEL AIR FILTER**

STAYNEW FILTER CORPORATION
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# The KAINER PRESSURE GOVERNOR

## for Hot Water Heating Systems

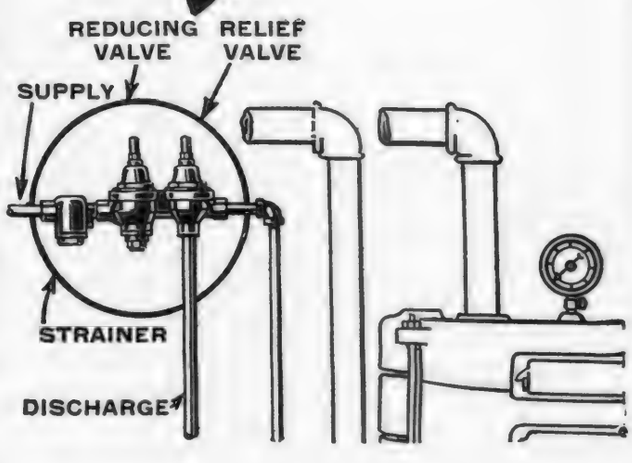
More and more plumbing and heating contractors and engineers are recommending and installing the KAINER Pressure Governor in place of expansion tanks and fittings on their hot water layouts.

The overwhelming nationwide acceptance of the KAINER during the past few years affords ample proof of the sound engineering principles that characterize the design and construction of this dependable Governor.

The KAINER Governor reduces the cost of a hot water layout, simplifies installations, makes a better job, saves your time and your customer's money, increases your profits and builds good will.

*Write today for full information*

KAINER & COMPANY
CHICAGO
761-771 MATHER STREET
*Manufacturers*



# Guaranteed

Johnston Boilers are guaranteed to carry their full rated loads at the steam or hot water outlets. They are also guaranteed as to material and workmanship. You can specify or install Johnston Steel Heating Boilers confident that you are securing the most substantially constructed and efficiently operating heating boilers obtainable, and that the Johnston Brothers organization will stand squarely behind their product.

# JOHNSTON STEEL HEATING BOILERS

Here are the outstanding points about Johnston Boilers:

1. **Substantial construction**
2. **Efficient operation**
3. **Built to A.S.M.E. Standards**
4. **Simplicity of design**
5. **65 years' boiler building experience**
6. **Fully guaranteed**

## JOHNSTON BROTHERS, Inc.

**FERRYSBURG, MICHIGAN**

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Name.....

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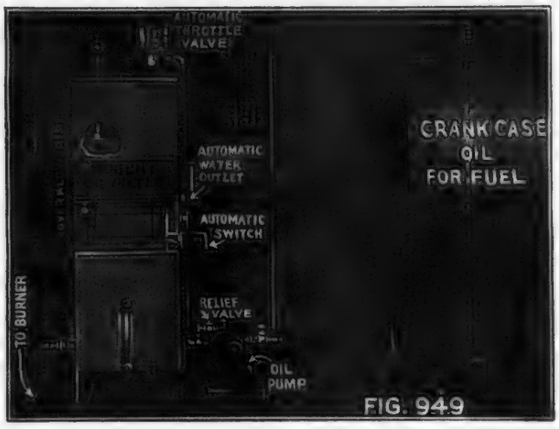
# Nugent Crank Case Fuel Oil Filter




**HEAT YOUR BUILDING WITHOUT COST**

BY BURNING DISCARDED CRANK CASE OIL

**NO MORE BURNER TROUBLE**

Write for catalog

**WM. W. NUGENT & COMPANY**

**409 N. Hermitage Ave., Chicago, U. S. A.**

Builders since 1897 of

Oiling Systems — Oiling Devices
Oil Filters — Oil Pumps

**Easy to install.**

**Just break the Oil Burner Suction Pipe and set it in.**

**They are shipped all assembled ready for use.**

**Only two connections to make.**

*Read this Letter*

MONARCH GARAGE

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Wm. W. Nugent & Co. December 19,1927.
Chicago,Ill.

Gentlemen:-

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This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

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We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

MONARCH GARAGE

By E. Lebkuecher

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Incorporated

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Norristown Pennsylvania

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*No Gas Pilot*
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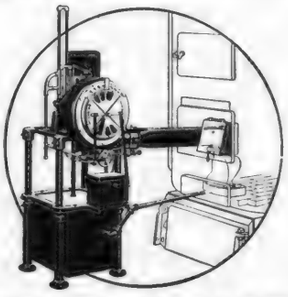

McILVAINE OIL BURNER

*Listed by Underwriters*

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*Graduated Automatic Control*
*Mechanical Draft*

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EVANSTON, ILLINOIS

# THE ROCHESTER CIRCULATOR

*One of the Greatest Single Improvements ever made in Hot Water Heating!*

It Removes the Universal fault from EVERY Hot Water Heating System.

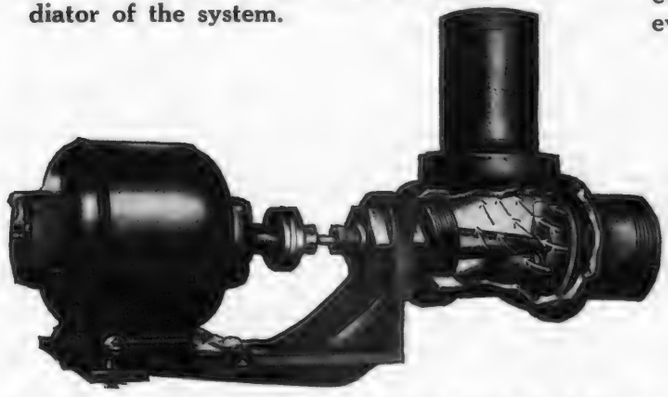
It Replaces slow, irregular, COSTLY, thermal circulation with the Modern SAVING of Instant, Forced Circulation.

Get the Benefit of the Perfect Heat Range that only Hot Water can give,—and get that Heat,—INSTANTLY,—into EVERY radiator of the system.

Save money in Fuel on EVERY system, new or old,—don't "blanket" the flue gas with sluggish, overheated water,—get the heat units out of the boiler into every radiator.

Save material and labor on every new job,—and know that the job is going to work perfectly.

Only the Rochester Circulator is made for every pipe size,—from 1 1/2″ to 12″,—for every heating system.



Write immediately for full technical information.

A few territories are still available for Distributors.

THE ROCHESTER CIRCULATOR CO., 429 Ravenwood Ave., Rochester, N.Y.

# The Franklin Heating Station* at Rochester, Minnesota is equipped with

# S&K STEAM POWER PLANT AUXILIARIES

*The list includes*

Steam Valves, Desuperheaters, Evaporators, Flow Indicators, Expansion Joints, Strainers, Etc.

The S&K descriptive bulletins give complete data.

*This utility furnishes light, heat, power, high and low pressure steam, compressed air and refrigeration to the properties of the Mayo Properties Association and of the Kahler Corp.

**The Franklin Heating Station**

Ellerbe & Co., Architects.
Fuel Economy Engineering Co., General contracting engineers of construction.
C. G. Hadley, Supt. of plant, in charge of operation.

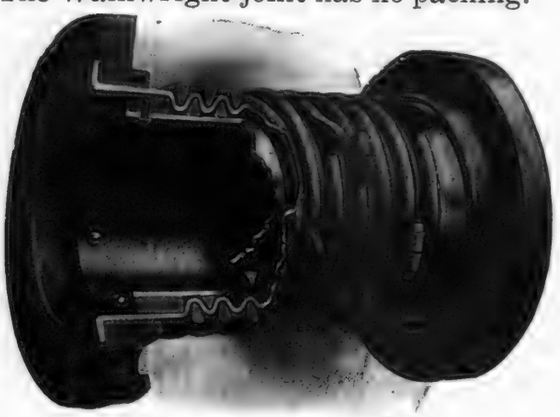
SCHUTTE KOERTING

**1153 Thompson St., PHILADELPHIA, PA.**

# Wainwright Joints Will Take Up Your Pipe Line Expansion

There is no more effective method of taking up the expansion in pipe lines carrying steam, hot water or oil, than by means of the Wainwright expansion joint.

The Wainwright joint has no packing.



Wainwright Improved Expansion Joint

Expansion of the pipe line is absorbed by a seamless, corrugated copper tube. Rings fitted inside and outside of the corrugations distribute the pipe movement so that each corrugation takes up a portion of the total expansion. An inside sleeve of the Wainwright joint protects the copper expanding portion from high velocity steam and reduces the friction loss, or resistance to flow, through the joint.

***Wainwright joints are built for 150 lb. working pressure in sizes 3 to 14 in., and for 125 lb. working pressure in sizes 16 to 24 in.***

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# Quiet!

THE USE OF SOUND PICTURES REQUIRES ABSOLUTE QUIET

AND YOU GET QUIET WHEN YOU USE AERO VALVE

Modern requirements demand the use of air diffusers that are locked perfectly tight so as not to rattle, that permit the finest regulation with the least labor and that are easy and economical to install. All of these requirements are met by the AERO-VALVE.

## MUSHROOM AIR DIFFUSERS

### Rigid Locking Device Prevents Rattling

Absolutely fool-proof. Simply turn lock against the valve and it is firmly locked in any position desired. The **ONLY** mushroom made the parts of which **cannot be separated** either before or after installation.

THE STRONGEST MUSHROOM MADE WITH HEAVY CAST IRON DOME AND SUPPORTS

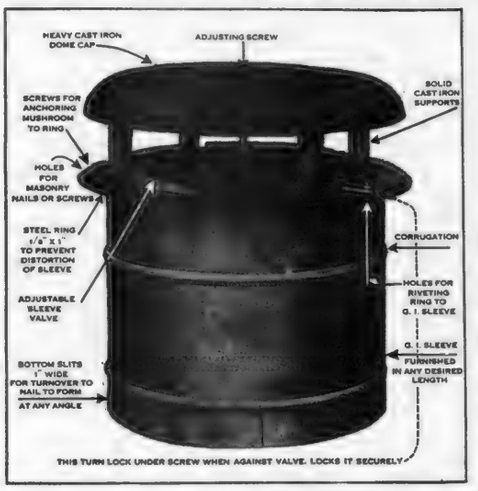
Steel Ring prevents distortion of sleeve, eliminates using sand and provides quick anchorage for mushroom. Furnished with or without sleeve and steel separately if desired for attachment to locally made sleeve.

Approved by leading Architects and Engineers. Send for booklet showing complete specifications.

**Knowles Mushroom Ventilator Co.**

**202 Franklin Street, New York City**

A SOLID COMPLETE UNIT


HEAVY CAST IRON DOME CAP
ADJUSTING SCREW
SCREWS FOR ANCHORING MUSHROOM TO RING
SOLID CAST IRON SUPPORTS
HOLES FOR MASONRY NAILS OR SCREWS
STEEL RING 1/8" X 1" TO PREVENT DISTORTION OF SLEEVE
CORRUGATION
ADJUSTABLE SLEEVE VALVE
HOLES FOR RIVETING RING TO G. I. SLEEVE
G. I. SLEEVE FURNISHED IN ANY DESIRED LENGTH
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE
THIS TURN LOCK UNDER SCREW WHEN AGAINST VALVE, LOCKS IT SECURELY

# 1879 50TH YEAR 1929

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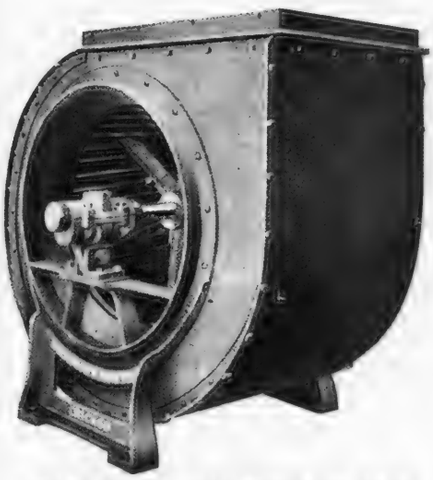

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*INTELLIGENT SERVICE*
*REAL DEPENDABILITY*

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*Catalogs and Engineering Data on request.*

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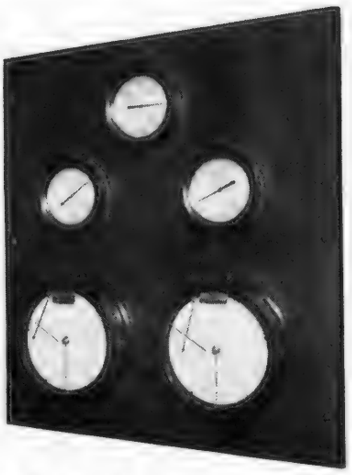

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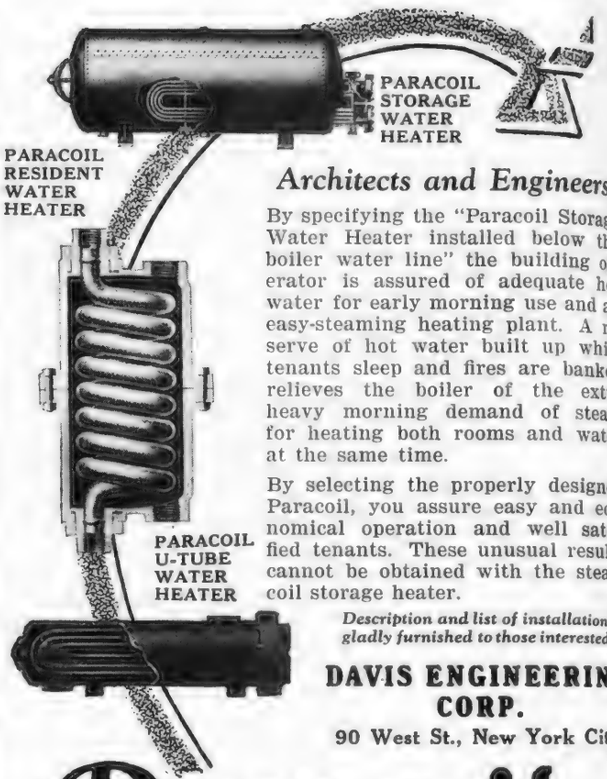
**Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure**



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**Automatic Electric Heat Control**

Consumer's Price $48.00 Installed

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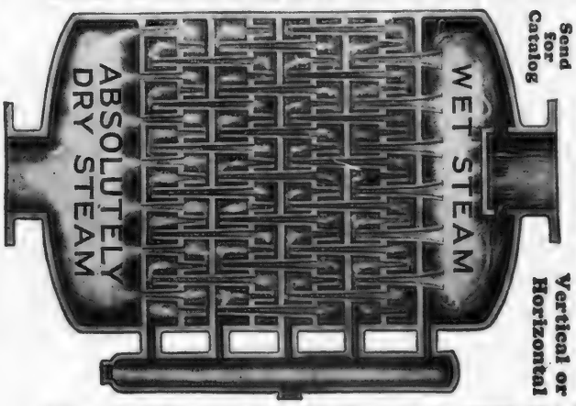
**OIL OR STEAM SEPARATORS**

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**OIL, DIRT OR WATER CAN NOT PASS**

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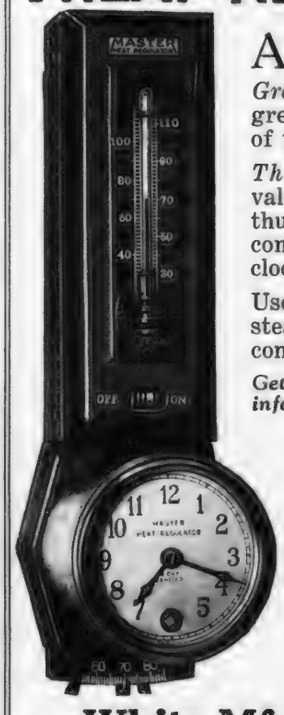

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*Thermostat* shows position of valves or dampers at all times, thus indicating to the user the condition of the fire. Plain or clock models.

Used with coal, gas or oil in steam, hot water, warm air or combination plants.

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For hot water heating systems—accurate, dependable, inexpensive. Installed without drawing boiler or stopping fire.

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Full Electric Motor

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**2362 University Ave., St. Paul, Minn.**

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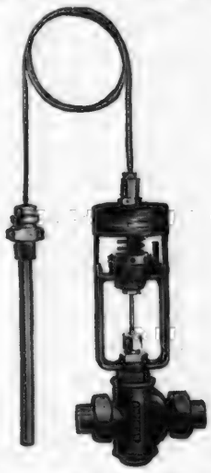

*American Precision Temperature Controller*

# for Water Heaters

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Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

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American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
U. S. Ozone Corp., Scottdale, Penn.
Vilter Mfg. Co., Milwaukee, Wis.
York Heating & Ventilating Corp., Philadelphia, Pa.

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Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.

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American District Steam Co., North Tonawanda, N. Y.
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Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

### AIR FILTERS
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Connor Co., Inc., The W. B., New York.
DeBothezat Impeller Co., Inc., New York
National Air Filter Co., Chicago, Ill.
Staynew Filter Corp., Rochester, N. Y.

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Swartwout Co., Cleveland, Ohio.

### AIR WASHERS
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Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.

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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

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Badger & Sons Co., E. B., Boston, Mass.

### BLOWERS, FAN
(See Fans, Supply & Exhaust).

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Combination Boiler Co., Benton Harbor, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Weil-McLain Co., Chicago, Ill.

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Brownell Co., The, Dayton, Ohio.
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Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Oil City Boiler Wks., Oil City, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
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Titusville Iron Wks. Co., Titusville, Pa.

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National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
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Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.
Spencer Heater Co., Williamsport, Pa.

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Combination Boiler Co., Benton Harbor, Mich.
Johnston Bros., Inc., Ferrysburg, Mich.
Titusville Iron Wks. Co., Titusville, Pa.

### BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

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Frost Mfg. Co., Galesburg, Ill.
Oil City Boiler Wks., Oil City, Pa.
Stanwood Corporation, Cincinnati, O.
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Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
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Foster Wheeler Corp., New York.
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National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

### CONDUITS, UNDERGROUND PIPE
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Ric-wiL Co., The, Cleveland, Ohio.

### CONVERTERS, HOT WATER
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Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

### COOLERS, AIR
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Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

### COOLERS, OIL
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National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

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Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
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Schutte & Koerting Co., Philadelphia, Pa.

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Ric-wiL Co., The, Cleveland, Ohio.

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Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

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Schutte & Koerting Co., Philadelphia, Pa.

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St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
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St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
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Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
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Wing Mfg. Co., L. J., New York.

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Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York.
Emerson Electric Mfg. Co., St. Louis, Mo.
Garden City Fan Co., Chicago, Ill.
Hartzell Propeller Co., Piqua, Ohio.
Ilg Electric Ventilating Co., Chicago, Ill.
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**HEATING AND VENTILATING UNITS**

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Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

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Davis Engineering Corp., New York.

### FILTERS, CRANK CASE OIL
Nugent & Co., Inc., Wm. W., Chicago, Ill.

### FILTERS, FEED-WATER
Davis Engineering Corp., New York.

### FITTINGS, ACID RESISTING
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

### FITTINGS, PIPE, COMPRESSION
Nugent & Co., Inc., Wm., W., Chicago, Ill.

### FITTINGS, PIPE, FLANGED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

### FITTINGS, PIPE, SCREWED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

### FLANGES
Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

### GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
General Gas Light Co., Kalamazoo, Mich.

### GASKETS, ASBESTOS
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

### GASKETS, METALLIC
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

### GASKETS, RUBBER
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

### GAUGE BOARDS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

### GAUGE GLASSES
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

### GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.

### GAUGES, DRAFT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

### GAUGES, HYDRAULIC
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

### GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

### GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

### GAUGES, TANK
Cook Electric Co., Chicago, Ill.
King-Seeley Corp., Ann Arbor, Mich.

### GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### GAUGES, WATER
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
Crane Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

### GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

### GOVERNORS (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Webster & Co., Warren, Camden, N. J.

### GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

### GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

### GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

### GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

### GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.

### GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

### HEAT CABINETS
(See Radiators, Cabinet and Concealed)

### HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

### HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Excelso Products Corp., Buffalo, N. Y.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
**Modine Mfg. Co., Racine, Wis.**
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

### HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.

### HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corp., Cincinnati, Ohio.
Whitlock Coil Pipe Co., Hartford, Conn.

### HEATERS, FEED WATER (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

### HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Excelso Products Corp., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

### HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Erie Heating Systems, Inc., Erie, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

### HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

### HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.

### HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
Schleicher, Inc., Gary, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

### HUMIDITY CONTROL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

### INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

### INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

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THREE STYLES
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Adaptable
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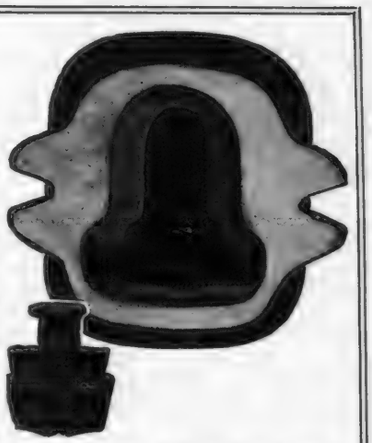

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Made in one size, and that one size will accommodate ¼ in., ⅜ in., ½ in., and ¾ in. rod, and ¼ in., ⅜ in. and ½ in. pipe. Seven in one. Efficient and economical.

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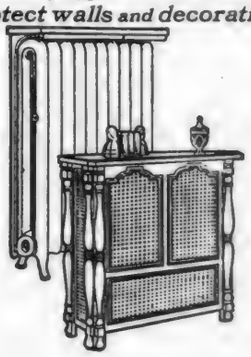
ANY FINISH ANY PERIOD

For every type and size radiator
*Protect walls and decorations*



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## EXCLUSIVE DISTRIBUTORS AND DEALERS *In Every Town for*
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(See Covering, Boiler, Pipe, etc.)

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Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

**KETTLES, COPPER**
Badger & Sons Co., E. B., Boston, Mass.

**MANOMETERS**
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

**MECHANICAL DRAFT APPLIANCES**
(See Draft Appliances, Mechanical)

**METALS, THERMOSTATIC**
Chace Valve Co., W. M., Detroit, Mich.

**METERS, CONDENSATION**
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

**METERS, FEED WATER**
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

**METERS, FLOW**
Foxboro Co., Inc., The, Foxboro, Mass.

**METERS, PITOT TUBE**
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

**METERS, STEAM**
American District Steam Co., North Tonawanda, N. Y.

**MOTORS (ELECTRIC)**
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**NOZZLES, ACID RESISTING**
Duriron Co., Inc., The, Dayton, O.

**NOZZLES, SPRAY**
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**OIL BURNERS**
American Nokol Corp., Chicago, Ill.
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Pascoe Co., The Wm. H., Chicago, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.

**OIL BURNER EQUIPMENT**
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

**OIL BURNER IGNITION AND CONTROL EQUIPMENT**
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

**OZONE APPARATUS**
United States Ozone Co. of America, Scottdale, Pa.

**PIPE, ACID-RESISTING**
Duriron Co., Inc., The, Dayton, O.

**PIPE BENDING**
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

**PIPE CASING (WOOD)**
American District Steam Co., North Tonawanda, N. Y.

**PIPE, CAST-IRON**
American Radiator Co., New York.

**PIPE HANGERS**
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

**PIPE THREADING & CUTTING MACHINES**
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

**PIPE, STEEL**
Clow Co., Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

**PRESSURE REDUCING VALVES**
(See Regulators, Pressure).

**PULLEYS, VARIABLE SPEED**
Horton Mfg. Co., Minneapolis, Minn.

**PUMPS, ACID RESISTING**
Duriron Co., Inc., The, Dayton, O.

**PUMPS, CENTRIFUGAL**
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

**PUMPS, CENTRIFUGAL, VACUUM HEATING**
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

**PUMPS, CONDENSATION**
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

**PUMPS, OIL**
Connor Co., Inc., The W. B., New York.
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., Inc., Wm. W., Chicago, Ill.

**PUMPS, RECIPROCATING STEAM**
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

**PUMPS, SUMP**
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

**PUMPS, TURBINE**
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

**PUMPS, VACUUM**
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

**RADIATOR ENCLOSURES AND SHIELDS**
American Metal Products Corporation, St. Louis, Mo.

**RADIATOR HANGERS**
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

**RADIATORS, CABINET AND CONCEALED**
Clow Co., Jas. B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Schleicher, Inc., Gary, Ill.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

**RADIATORS, CAST-IRON**
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
U. S. Radiator Corp., Detroit, Mich.

**RADIATORS, GAS HEATED**
Clow Co., Jas. B., Chicago, Ill.
General Gas Light Co., Kalamazoo, Mich.

**RECEIVERS, AIR**
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

**RECEIVERS, CONDENSATION**
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

**REFRIGERATING APPARATUS**
Vilter Mfg. Co., Milwaukee, Wis.

**REGULATORS, BOILER-FEED**
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

**REGULATORS, DAMPER**
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicgao, Ill.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

**REGULATORS, PRESSURE**
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

**REGULATORS, TEMPERATURE**
(See Temperature Control)

**SEPARATORS, OIL**
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

**SEPARATORS, STEAM**
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

**SPRAY COOLING SYSTEMS**
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**SPRAY NOZZLES**
(See Nozzles, Spray)

**STERILIZER, WATER**
U. S. Ozone Corp., Scottdale, Penn.

**STOKERS, MECHANICAL**
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
Fire-King Stoker Co., Indianapolis, Ind.
General Stoker Corp., New York.

**STRAINERS, OIL**
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nugent & Co., Inc., Wm. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

**STRAINERS, STEAM**
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

**STRAINERS, WATER**
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

**TEMPERATURE CONTROL**
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.

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**Not a particle of steam gets away.**
**Nothing that ought to stay in gets out.**
**Nothing that ought to get out stays in.**

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American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

### THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

### TRAPS, BUCKET

Crane Co., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

### TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

### TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.

### TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

### TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

### TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

### TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

### TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

### TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

### TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

### UNIT HEATERS

(See Heaters, Unit)

### VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

### VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

### VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

### VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

### VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

### VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

### VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

### VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

### VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

### VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

### VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

### VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

### VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

### VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

### VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

### VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

### VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

### VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

### VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

### VALVES, STOP AND CHECK

(See Valves, Non-Return).

### VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

### VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

### VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

### VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

### VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

### VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

### WATER STERILIZERS

Clow Co., Jas. B., Chicago, Ill.

### WEATHER STRIPS, METAL

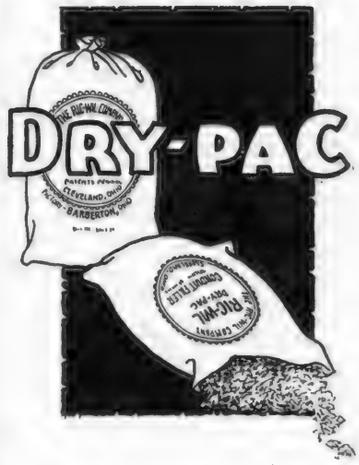
Athey Co., Chicago, Ill.

### WRENCHES, STILLSON

Walworth Co., New York.

### ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Webster Talmadge, New York.




# A Guarantee of Underground Steam Main Efficiency — Insulation That Moisture Cannot Penetrate

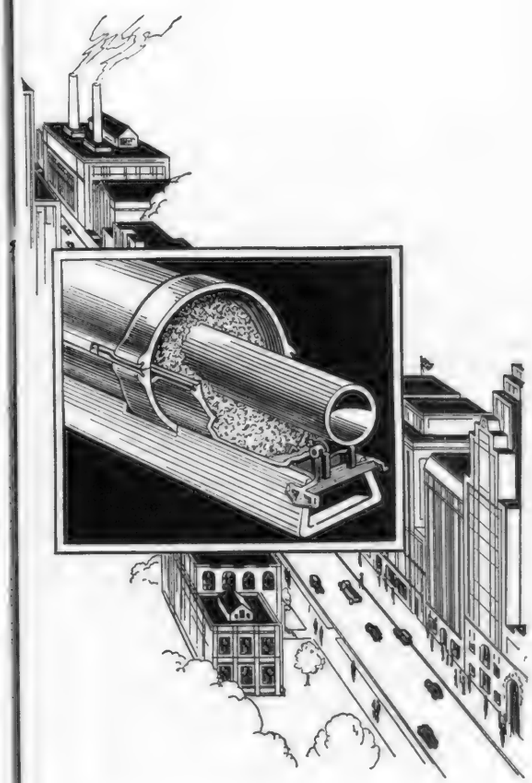
SINCE moisture makes insulating materials worse than useless, the most serious problem of the heating engineer planning underground steam lines has in the past been to make the conduit water-tight.

Ric-wiL engineers developed a notably successful type of water-tight conduit, as evidenced by the Ric-wiL Base Drain Foundation, Loc-liP Side Joint and other engineering features; but the problem was not completely solved until the perfection of Dry-paC several years ago.

This asbestos filler-type insulation is water-proof. Packed around the pipes in a conduit at the proper density, it repels all moisture. Scores of tests have demonstrated this; several cases where incompleted work has been accidentally flooded have proved it with astonishing certainty. This means that leaks in conduit or pipe, which once meant temporary and perhaps permanent impairment of the installation, are now powerless to change the high constant efficiency of Dry-paC insulated lines.

Time, moisture nor temperature affect Dry-paC. And its efficiency is extraordinary. Tests of completed Ric-wiL installations are showing 92% to 94% efficiencies.

*Guarantee the permanent success of your next underground steam lines with Ric-wiL Conduit, closed construction, insulated with Dry-paC. We shall be glad to give you further information, including Dry-paC sample for testing.*



From steam plant to the radiators that dispense the heat, whether in commercial buildings, schools, hospitals or manufacturing buildings, Type F Ric-wiL Conduit with Dry-paC reduces line losses to from 6% to 8%.

**The Ric-wiL Company**

**1567 Union Trust Bldg., Cleveland, Ohio**

**New York Atlanta Chicago**

**Originators *of* Waterproof Conduit Filler**

UNDERGROUND CONDUIT

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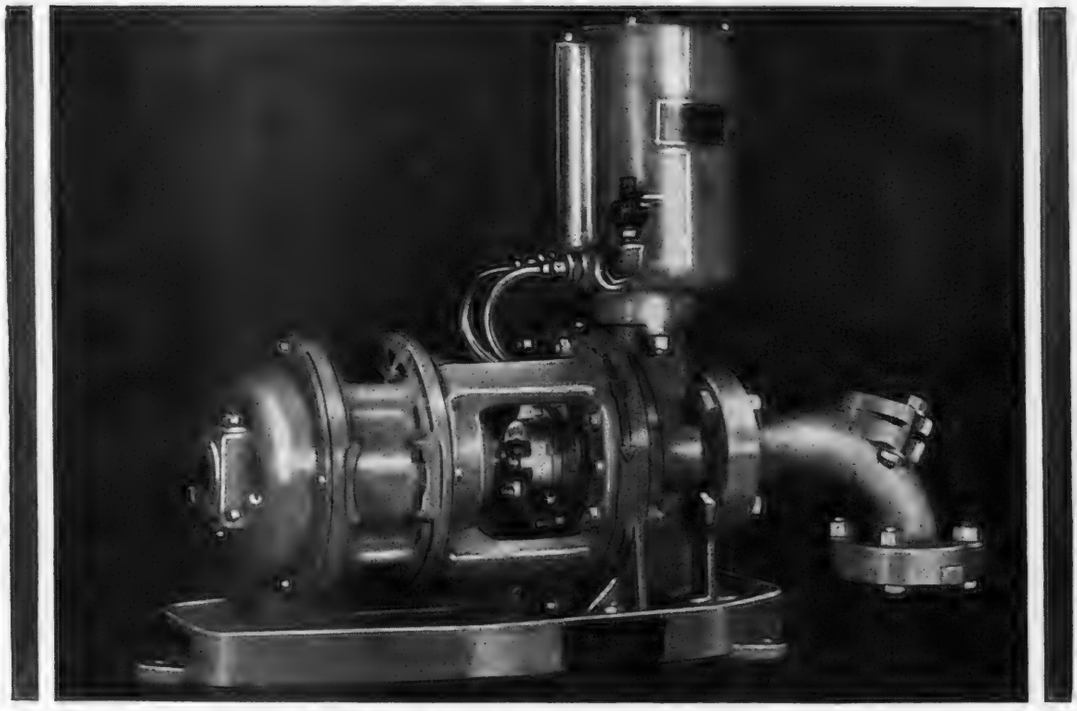
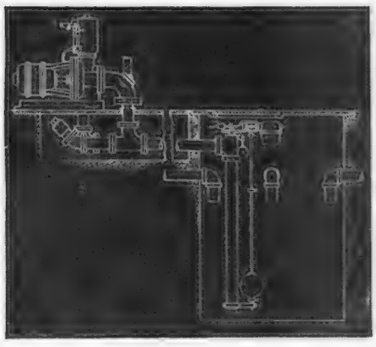


Jennings Suction Sump Pumps are furnished in standard sizes with capacities ranging from 30 to 250 g.p.m. Heads up to 60 ft.

# Only the suction pipe is submerged



By mounting a bronze air rotor on the same shaft with the water impeller, the Jennings Suction Sump Pump is made more than self-priming. In operation, this rotor exhausts air from the centrifugal housing and suction line and permits the unit to handle air or gas along with the water being pumped.

Because of this unusual feature, none of the working parts of the pump are submerged. And, where space is at a premium the pump may be placed wherever convenient, either near to or remote from the sump.

Both the driving motor and pump of the Jennings Suction Sump Pump are of standard horizontal pattern. Being outside the sump they are quickly and easily accessible. Since no long vertical shaft is required, there are no thrust bearings to take care of. The only two moving parts—air rotor and water impeller—rotate without metal to metal contact in the casing. Long wear and dependable operation are assured.

Bulletin 97 gives complete information on the Jennings Suction Sump Pump. Write for a copy.

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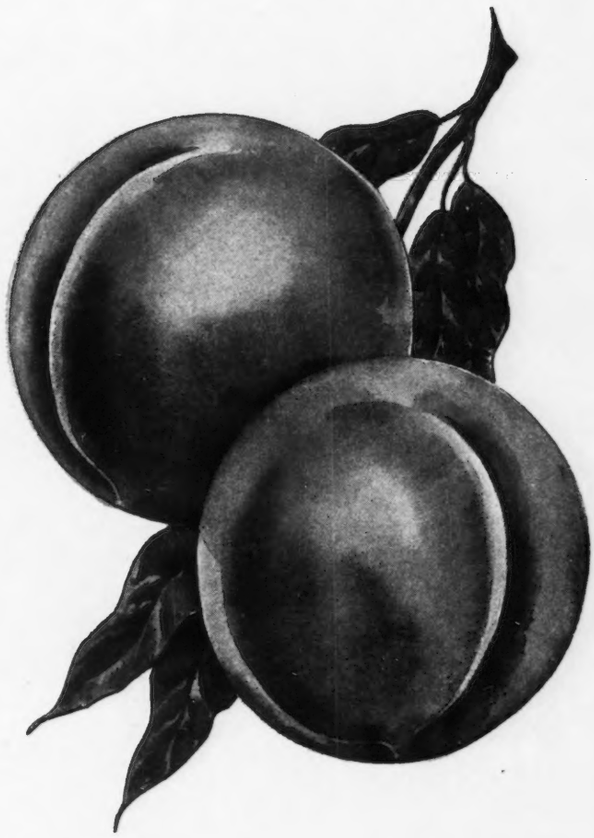
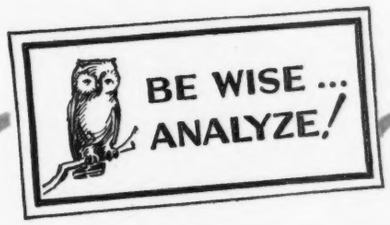
# Are they equally good to eat?



**Here are two peaches. They are *both* fine looking. But in the eating, one may be delicious; the other, a disappointment.**




And in the same way, various boilers may often *appear* much alike in construction, yet upon careful examination, be vastly different. So the alert steam fitter today *analyzes*. He checks up carefully and with what result?

*Take the Weil-McLain Round Boiler as an example. When he analyzes this boiler for heat utilization*

... he finds unique and practical features that prevent waste up the chimney and result in better utilization of the heat produced by the fire.

For instance, corrugations like this ~~~ in the crown sheet section, as well as in all other vital heating surfaces above the fire, crowd more heat absorbing surface into the same space.

Again, a balanced back-and-forth fire travel, that cannot short cut to the chimney under *any* condition, serves as a final safeguard against chimney waste.

In short, only through analysis and comparison can you fully appreciate how richly scientific research, skillful engineering, careful thought for the users of the boilers, as well as for the heating contractors who install them, have contributed to the perfection of Weil-McLain Boilers.

Weil-McLain Boilers excel in fuel combustion, heat utilization, convenient operation, in meeting modern fuel trends and in ease of installation. They give more heat. *They fight fuel waste.*

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# A KICK
## *that bought Harry a Cadillac*

This is not a pipe dream. The kick came from cranky A. C. Black. That's not his real name, of course, but he nearly raised the roof of Harry's shop.

A one-pipe steam job Harry installed in Black's house hadn't any pep. It took an hour to put heat in the radiators. Heat faded half an hour after pressure went down.

Harry thought of Hoffman No. 2 Valves. He rushed a man to Black's house. In a couple of hours the system was tightened up, two Hoffman No. 6 Valves put on the return mains, and the radiator vent valves replaced with Hoffman No. 2 Vacuum Valves.

Black kept on talking. But his story was different. Men like Black are good advertisements for any heating contractor, when the job pleases.

You know what a partial vacuum does for a one-pipe steam job. Black boasted of his system to his friends. In a year Harry had made enough money on jobs referred to him by Black — Hoffman No. 2 Vacuum Valve installations and other work that came through these new customers—to buy a Cadillac.

Hundreds of heating contractors don't even wait for kicks. They Hoffmanize every one-pipe steam job they put in. They suggest Hoffman No. 2 Vacuum Valves every time they are called in for repair work.

Why not learn how these successful men add much to their profit and reputation. A post card to us brings full information. Address Hoffman Specialty Co., Inc., Dept. C-51, Waterbury, Conn.

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